University of Hormozgan

Iranian Journal of Educational Research

Print ISSN: 1735 - 563X Online ISSN: 2980 - 874X

Homepage: http://ijer.hormozgan.ac.ir

Educational and Behavioral Research Center

Identifying the Dimensions and Components of Professors' Thinking Styles with a Psychological Approach in Universities

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Article Info

Article type:

Research Article

Article history:

Received 17 Mar. 2024

Received in revised form 21 Apr. 2024

Accepted 19 Jul. 2024

Published online 01 Sep. 2025

Keywords:

Thinking style,

Psychological approach,

Professor,

University

ABSTRACT

Objective: This study aimed to identify and investigate the dimensions and components of professors' thinking styles with a psychological approach in the universities of Babol City in 2022.

Methods: This study was applied in terms of purpose and adopted a mixed method with an exploratory approach. The statistical population of the qualitative study consisted of experts in the field of education who were selected purposefully, and finally, due to the saturation method, 12 experts were selected as a sample. The research data collection tool in the qualitative phase was a semi-structured interview whereas, in the quantitative section, a researcher-made questionnaire was extracted from interviews. Data in the qualitative phase were analyzed using thematic analysis, and in the quantitative phase, confirmatory factor analysis, divergent, and convergent validity were used. The face, content, and construct validity of the instrument were confirmed. Their composite reliability and Cronbach's alpha were calculated above 0.70, which was approved.

Results: The study identified two dimensions of professors' thinking styles: functional (analytical, creative, executive, realistic) and orientational (collaborative, critical, free-thinking, conservative). All dimensions and components were confirmed to influence professors' thinking styles. Quantitative analysis showed that thinking style variables (structural and managerial) followed a normal distribution (Kolmogorov-Smirnov, $p > 0.05$), and the KMO & Bartlett test further validated the assumptions ($p > 0.05$).

Conclusions: These findings highlight the importance of understanding professors' cognitive processes in teaching and research. Recognizing these styles can guide universities in designing targeted training and interventions to strengthen thinking skills and improve student learning outcomes.

Cite this article: Hasanimoghadam, B., Hosseini Dronkalaei, Z. & Hosseinzadeh, B. (2025). Identifying the dimensions and components of professors' thinking styles with a psychological approach in universities. *Iranian Journal of Educational Research*, 4 (3), 1-20.

. DOI: https://doi.org/10.22034/4.3.1

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Publisher: University of Hormozgan.

DOI: https://doi.org/10.22034/4.3.1

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Introduction

Universities and higher education institutions are now considered highly influential organizations in developing countries (Zahra Najafzadeh, 2021). Effective education has long been a concern in the education sector. The role of professors, particularly their teaching methods, is viewed as crucial in promoting successful learning outcomes. It is critical for higher education institutions to understand the factors that influence classroom learning. Learning is a fundamental goal of education. Professors' performance has a significant impact on student learning. Their teaching methods, instructional strategies, and ability to create a positive learning environment have a major impact on student engagement and success (Chaudhary & Singh, 2022). Institutions of higher education must have a comprehensive understanding of faculty competencies and the factors that impact classroom learning. In the context of the current situation, variables such as learning and intelligence are crucial considerations when examining the conditions that influence classroom learning outcomes in a particular country (Hossinpanah & Kazemianmoghadam, 2021). Thinking styles, also called cognitive styles, refer to a person's preferred approach to thinking and processing information. It is important to note that thinking style is different from intellectual capacity because it refers to how individuals use their cognitive abilities rather than their inherent intelligence (Messick, 2021). While individuals may have similar cognitive abilities, their thinking styles can vary significantly. The study of thinking styles in the context of education and learning is closely linked to the concept of intelligence, which has the potential to predict academic performance and learning outcomes (Chaudhary & Singh, 2022) . Understanding the interplay between thinking styles and intelligence can provide valuable insights into optimizing educational practices and promoting positive learning experiences (Hossinpanah & Kazemianmoghadam, 2021).

Professors' thinking style and motivational approach can have a big impact on student motivation and engagement. Professors play a critical role in shaping the student learning experience and have the ability to use a variety of teaching methods, strategies, and interpersonal behaviors that can either increase or decrease student motivation and engagement in daily classes (Lauermann & Berger, 2021). Professors who adopt an autonomy-supportive style that includes acknowledging students' perspectives, providing choice, and fostering internal motivational resources have been shown to promote greater student engagement, satisfaction, and learning outcomes (Thommen et al., 2022). In contrast, professors who exhibit a more controlling style, characterized by the use of

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pressurized language, extrinsic rewards, and strict adherence to class schedules, can undermine student motivation and lead to passive, disinterested behavior (Akyurek et al., 2018).

Various styles theories have been proposed since the cognitive style movement in the late 1960s and 1970s. (Grigorenko & Sternberg, 1995) classified these style theories into three groups: cognition-centered, personality-centered, and activity-centered. These style theories have been used in the study of people's intellectual performance in both academic and nonacademic settings. The theory of mental self-government (Sternberg, 1988) describes people's thinking styles; that is, their preferred ways of doing things or of using the abilities they have. The essential notion of this theory is that people need somehow to govern or manage their everyday activities and that there are many ways of doing so. People tend to use styles with which they are comfortable (Sternberg, 1997).

The theory of mental self-government delineates 13 thinking styles that fall into five dimensions of mental self-government: (a) functions, (b) forms, (c) levels, (d) scopes, and (e) leanings of government as applied to individuals. There are three functions in the intellectual self-government of the individual: legislative, executive and judicial. A person with a legislative style often enjoys dealing with tasks that require self-teaching and self-direction. A person with a leadership style, on the other hand, finds more satisfaction in completing tasks with clear instructions. An individual with a judicial style focuses his attention on evaluating the results of his activities (Piri & Pourfarhadi, 2018).

The mental self-government of an individual takes four different forms: monarchical, hierarchical, oligarchic and anarchic. A person with a monarchical style often enjoys tasks that allow them to fully concentrate on one thing. In contrast, a person with a hierarchical style prefers to devote their attention to multiple prioritized tasks within the same time period (Narimani & Sadeghzadeh Belil, 2024). A person with an oligarchic style also enjoys working to achieve multiple goals within the same time frame, but may be reluctant to prioritize. Finally, a person with an anarchic style enjoys working on tasks that allow for extreme flexibility in completing the task. People with an anarchic style avoid systems (Hashemi & Gholami, 2024).

Studies using these measures (Grigorenko & Sternberg, 1995); (Sternberg, 1988);(Piri & Pourfarhadi, 2018); and (Narimani & Sadeghzadeh Belil, 2024) have indicated that the theory of mental self-government has a heuristic and predictive value in educational settings. (Grigorenko

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& Sternberg, 1995) conducted a series of studies among school teachers and students. In their first study, they found that teachers' thinking styles differed depending on their characteristics and the ideologies of the schools where they worked. For example, older teachers were more leadership-oriented, local, and conservative than younger teachers. Science teachers tended to be more local; humanities teachers tended to be more liberal. They also found that teachers in urban public and Catholic parochial schools were significantly more conservative in their thinking style, on average, than were teachers in an elementary private school in which emotional education was emphasized (Grigorenko & Sternberg, 1995).

(Badamchi & Yazdani, 2023) conducted a study to examine the relationship between Sternberg's thinking styles and the three dimensions of perfectionism with the well-being of female high school students in Khoy City. The research results indicated a significant and positive relationship between thinking styles and their components (legislative, executive and judicial thinking styles) with the well-being of high school students. Additionally, thinking styles and perfectionism were found to predict the well-being of female high school students. (Behfar et al., 2021) conducted a study titled “The Relationship between Thinking Styles and Emotional Intelligence with Family Functioning in Married Women.” The results showed that there was no significant relationship between thinking styles and overall family functioning. No significant association was found between thinking styles and other components of family life such as role fulfillment, emotional fusion, and emotional support. (Mirshojaeiyan Hosseini et al., 2018) conducted a study titled “Examining the relationship between thinking styles and self-esteem with the management competence of education managers in Mashhad primary schools”. The results showed that there was a significant negative relationship between thinking styles such as legislative, executive, legal, analytical, conservative, hierarchical, authoritarian, anarchist and internal thinking styles, as well as general managerial competence among educational managers. On the other hand, there was a significant positive relationship between overall thinking style, freethinking style, egocentric thinking style and external thinking style and general management competence in education managers.

(Shafiei Servestani et al., 2020) conducted a study titled “The Role of Teachers’ Thinking Styles in the Effectiveness of Classroom Teaching in the Education System.” The study aimed to examine the relationship between teachers' thinking styles and the effectiveness of classroom teaching in

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the education system. The results of the study showed that there were no significant differences in the correlation between thinking styles and teaching effectiveness in the four different areas examined. Furthermore, no significant differences were found in the correlation between thinking styles and teaching effectiveness between fifth and sixth grade classes. These results suggest that teachers' thinking styles may not have a significant impact on classroom teaching effectiveness.

The study's literature review highlights a significant gap in research on professors' thinking styles. To fill this gap, this study aims to investigate the dimensions and components of professors' thinking styles with a psychological approach in universities. The present study addressed the subsequent questions as follows:

1) What are the dimensions and components of professors' thinking styles with a psychological approach in universities of Babol City?

2) What is the ranking of the dimensions and components of professors' thinking styles with a psychological approach in universities of Babol City?

Material and Methods

The study employed a mixed-method approach that combined qualitative and quantitative methods to conduct a descriptive analysis. (Abuhamda et al., 2021) stated, "Quantitative and qualitative methods are the engine behind evidence-based outcomes." In the qualitative section, the data were analyzed using the Thematic Analysis Method (TAM), which emerged from the work of (Braun & Clarke, 2006). The exploratory and confirmatory factor analyses were used in the quantitative part. The main objective of the qualitative phase was to explore and examine the concepts and factors related to professors' thinking styles from a psychological perspective to develop a questionnaire for the quantitative phase. Therefore, in this qualitative phase, data were collected through semi-structured and exploratory interviews with academic experts who were purposively selected. The collected data was then analyzed to identify the concepts and factors. In the quantitative phase, the dimensions and indicators obtained in the qualitative phase were subjected to statistical analysis and their quantitative significance was determined. Therefore, the descriptive survey research method was used in this phase. The statistical population of the qualitative study consisted of experts in the field of educational administration, educational psychology, and curriculum studies who were selected purposefully, and finally, due to the saturation method, 12

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experts were selected as a sample. Theoretical saturation was the main criterion to justify the sample size. Data collection was conducted using semi-structured interviews. The researcher achieved data saturation after interviewing the eleventh participant, which aligns with the saturation law. However, to ensure the adequacy of the data, the interviewing process continued until the twelfth participant. The validity and reliability of this research were evaluated with the contribution of interviewees and a PhD student of educational administration as the assessor. He was asked to help the research group in the coding process for the first four interviews to find the percentage of accordance between the codes and intercoder reliability (ICR). The below equation shows how to find this percentage:

$$ICR\ Percentage = \frac{2 \times agreements}{Total\ number\ of\ Codes} \times 100\%$$

The coding process between the research group and evaluation group is demonstrated in Table 1:

Table 1. Researcher and Assessor's Coding Comparison

Interviewee	No. of Codes	Agreements	Disagreements	ICR
I	11	4	7	72%
II	18	7	11	77%
III	17	7	10	82%
Total	46	18	28	78%

According to the above Table, 46 codes were defined from four interviews, in which 18 comments agree, and 28 disagreements were identified between the research and evaluation groups. This shows a good percentage of reliability that is above 60% (Braun & Clarke, 2006). After the coding process and classification, primary drafts were given to the interviewees to check the accuracy of the notes collected by the research group, which were based on their opinions, and their agreement proves the validity of this research.

The researcher reviewed relevant literature and theoretical foundations on professors' thinking styles to initiate the study. The first step involved conducting face-to-face interviews with selected faculty members, following the specifications outlined in Table (2). Each interview session lasted approximately 65 minutes and was recorded. The research topic was explained during the

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interviews, and the interviewees were invited to share their opinions on thinking styles. The interviews commenced with an introduction to the research topic and the idea of thinking styles in universities. Subsequently, additional questions were posed based on the participants' answers. The interviews were recorded, and experts were given a survey form. Following each interview, the recorded information was transcribed into written form, and the data from the interviews were analyzed to establish the research model. To observe the ethical consideration in this research, it was tried to collect the data after obtaining the participants' consent.

Moreover, the participants were assured of the confidentiality of their personal information, and results were provided without specifying the names and details of participants. The statistical population in the quantitative phase included all (presidents, vice-presidents, and official administrations) of Babol universities, and then 300 participants selected by stratified random sampling. This study takes into account several ethical considerations to ensure the integrity and responsible conduct of the research. In addition, inclusion and exclusion criteria for the selection of participants demonstrate at least ten years of teaching experience in a relevant field at the University of Babol, Mazandaran University, or Babol Azad University. Exhibit proven expertise in teaching the subject matter relevant to the research topic. Maintain a consistent record of research publications in peer-reviewed journals related to the research topic. Actively engage in research activities within the relevant field. The participants were asked to answer the researcher-developed questionnaire that was extracted from interviews. To create a questionnaire from the conceptual model, 20 specialists in the field of educational administration, educational psychology, and curriculum studies were consulted. After two rounds of consensus, a final model was derived with an impressive agreement rate of over 80% among the experts.

This questionnaire consists of 48 questions and assesses two dimensions, “performance” and “orientation,” and eight components: analytical thinking style, creative thinking style, executive thinking style, realistic thinking style, collaborative thinking style, critical thinking style, free thinking style and conservative thinking style. The questionnaire is based on a 5-point Likert scale (very low, low, moderate, high and very high) and is rated from 1 to 5. In the quantitative phase, 300 people were selected from 1373 faculty members and administrators from Farhangian University of Babol, Mazandaran University, and Azad University of Babol using stratified random sampling method based on Cochran's formula. These participants completed the

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professors' thinking styles questionnaire. Ethical considerations were also carefully considered throughout the research process in the quantitative section, demonstrating the researcher's commitment to respecting the participants' involvement and confidentiality. The demographic characteristics of the experts involved in the research are presented in Table 2.

Table 2. Demographic Characteristics of the Interviewees

Code	Position	Field of study	Years/Experience	University
1	Assistant prof	Educational administration	14	Mazandaran University
2	Associate Pro	Curriculum studies	18	Farhangian University
3	Assistant prof	Educational psychology	19	Islamic Azad university
4	Assistant prof	Educational sciences	24	Professional Sport
5	Associate Pro	Curriculum studies	15	Farhangian University
6	Associate Pro	Educational psychology	9	Islamic Azad university
7	Assistant prof	Educational administration	8	Islamic Azad university
8	Assistant prof	Educational administration	23	Mazandaran University
9	Associate Pro	Educational psychology	12	Islamic Azad university
10	Assistant prof	Curriculum studies	17	Islamic Azad university
11	Associate Pro	Curriculum studies	27	Farhangian University
12	Assistant prof	Educational administration	14	Mazandaran University

Results

The qualitative part of the research

In the qualitative part, the main aspects of each semi-structured interview were first identified by listening to recorded interviews and reviewing interview notes. The essential and fundamental points from each interview were then identified. The necessary categorization was carried out by classifying the key points using specialist terminology, coding and coherent thematic grouping. Each interviewee's labeled phrases were then organized into a tabular format based on their relationships and relevance, resulting in categorized dimensions. To facilitate the organization and systematic categorization of related topics, the MAXQDA 2020 software was used. First, 25 experts were identified for interviews based on the expert selection criteria and the interview

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process began. After the interview with the 12th participant, a total of 48 questions were divided into 2 dimensions and 8 components. Through initial analysis and coding, it was determined that each dimension as well as the main and sub-themes found in the interviews were mentioned and highlighted by the experts at least 2 times and a maximum of 4 times. A summary table was created for each respondent who was part of the expert group in the field and all key points mentioned by that interviewee were summarized and categorized in this table.

Table 3. Coded themes from theoretical foundations and thematic analysis discussed in interviews

Interviewee No.	Functional	Creative style	Executive style	Analytical style	Collaborative style	Critical style	Realistic style	Orientational	Conservative style	Free thinking style
1st interviewee	17	3	3	2	2	۳	3	5	2	2
2nd interviewee	2	3	2	2	2	۲	2	4	1	2
3rd interviewee	4	2	2	2	2	3	2	3	2	2
4th interviewee	2	2	2	2	2	2	2	4	2	2
5th interviewee	4	2	3	2	2	2	2	2	2	2
6th interviewee	3	2	3	2	2	2	2	3	3	2
7th interviewee	3	2	2	2	2	1	2	2	2	2
8th interviewee	1	2	2	2	2	2	2	4	2	2
9th interviewee	3	2	2	2	2	3	2	3	3	2
10th interviewee	4	2	1	2	2	3	2	4	2	1
11th interviewee	2	2	2	2	3	2	2	4	2	2
12th interviewee	3	2	3	3	2	2	2	3	1	2

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Among the answers given during the expert interviews, it was found that each dimension and component was mentioned and highlighted by the respondents at least once and a maximum of four times.

Table 4. Frequency of mentions for each dimension and component by the experts

Parent code	Code	Cod. seg. (All documents)	Cod. seg. (active/documents)	% Cod. seg. (All documents)	% Cod. seg. (active/documents)
Functional	Analytical style	25	25	9.47	9.47
Functional	Collaborative style	25	25	9.47	9.47
	Orientation	41	41	15.53	15.53
	Function	48	48	18.18	18.18
Functional	Creative style	26	26	9.85	9.85
Functional	Executive style	27	27	10.23	10.23
Orientational	Conservative style	24	24	9.09	9.09
Orientational	Free thinking style	23	23	8.71	8.71
Orientational	Critical style	0	0	0.00	0.00
Functional	Realistic style	25	25	9.47	9.47

The dimensions that were most frequently mentioned and discussed in detail were the functional dimension and the orientational dimension and their respective components. The functional dimension had a total of 48 common concepts among the experts' responses, while the orientational dimension had 41 common concepts. The tables above represented the coded data and themes derived from the qualitative interviews. By integrating theoretical sources with the insights presented by the experts and conducting a thorough thematic analysis, a comprehensive list of components was formulated to facilitate the development of a questionnaire.

The quantitative part of the research

1. What are the dimensions and components of professors' thinking styles with a psychological approach in universities of Babol City?

We performed an exploratory factor analysis to identify and rank our data's various dimensions and components. Before analyzing the data, we conducted the Kaiser-Meyer-Elkin Measure of Sampling Adequacy and Bartlett's goodness-of-fit tests to ensure suitability. To determine the variables' adequacy, we utilized the KMO statistic, with a value above 0.70 being deemed appropriate for factor analysis. Additionally, we utilized Bartlett's test to assess the correlation between the variables, which is essential for a meaningful and useful factor analysis model. As a

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result, we formulated a statistical hypothesis with regard to Bartlett's test to ensure sufficient samples and to determine the correlation between the variables (items).

Table 5. The results of the Bartlett and KMO test

			Value
Kaiser-Mayer-Olkin value (adequacy of sample size)			**0.850**
	Chi-square value (χ2)		**14931.049**
Bartlett's sphericity test	Degrees of freedom		**1128**
	Significance level		**0.001**

According to the results of table (5) at the confidence level of 95% and the measurement error of α=5%, the value of the KMO statistic was calculated to be more than 0.7. Also, the result of Bartlett's test showed that the significance level was calculated to be less than 0.05 (Sig < 0.05), therefore, sufficient evidence was not observed to confirm the null hypothesis, and the research hypothesis is confirmed. The result of the KMO test in Table 5 was 0.850, which reflected strong since it was higher than the significance value of 0.80. This value indicates that the number of research samples is sufficient for factor analysis, and it is possible to perform factor analysis for the desired data. The data can be reduced to a series of latent. Also, the results of Bartlett's test (Sig = 0.001, χ2 = 14931.049) show a high correlation between the items, so it is permissible to continue and use other stages of factor analysis.

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Table 6. Cronbach's Alpha Values, Composite Reliability, and Average-Variance Extracted Index for Research Variables

Components	Cronbach's Alpha	Composite Reliability	AVE	Significance Level
Analytical style	0.953	0.960	0.752	0.001
Creative style	0.896	0.916	0.526	0.001
Executive style	0.882	0.919	0.740	0.001
Realistic style	0.927	0.945	0.775	0.001
Collaborative style	0.937	0.952	0.799	0.001
Critical style	0.846	0.869	0.689	0.001
Free-thinking style	0.870	0.906	0.659	
Conservative style	0.838	0.892	0.673	0.001

Cronbach's alpha and composite reliability indexes were used to assess the reliability of the internal consistency of measurement model variables. Composite reliability and Cronbach's alpha coefficient for all of the constructs were over the recommended threshold of 0.70, indicating the adequate internal consistency of multiple items for each construct. Therefore, the reliability and internal consistency of research variables were confirmed. The extracted average variance index was used to assess the convergent validity of the research measurement model. Convergent validity indicates whether a test designed to measure a particular construct correlates with other tests that assess the same or similar construct. The extracted average variance index estimates the explanation of the variance of the questions by the latent variable. The minimum accepted value for the extracted average variance index was 0.5. The convergent validity is confirmed according to the values of the extracted average variance index in Table (6).

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Table 7. The results of confirmatory factor analysis

Dimension	Standard coefficient	T-Value	R^2	Components	Standard Coefficient	T-Value	R^2
Functional	0.695	7.767	0.767	Analytical style	0.757	23.028	0.574
				Creative style	0.817	39.820	0.667
				Executive style	0.720	25.884	0.518
				Realistic style	0.743	24.672	0.552
Orientation	0.810	34.745	0.857	Collaborative style	0.656	12.467	0.430
					0.517	13.890	0.267
				Critical style	0.965	207.595	0.930
				Free-thinking style	0.954	140.853	0.911
				Conservative style			

The results of the confirmatory factor analysis presented in Table (7) showed that at the 99% confidence level, the T-Values for all professors' thinking styles components are outside the range (2.58, -2.58). The orientation dimension with a standard coefficient of (0.810) has more impact and the functional dimension with a standard coefficient of (0.695) has less impact. Among the functional dimension, the highest standard coefficient (0817) is related to the creative style component and the lowest standard coefficient (0.720) is related to the executive style component. Also, among orientation dimension, the highest standard coefficient (0.965) corresponds to the free-thinking style component and the lowest standard coefficient (0.517) corresponds to the critical style component. Furthermore, the R2 values are strong for all components except the critical style and collaborative style components. Therefore, there is a significant and positive relationship between the variables of thinking styles in universities. Furthermore, considering the R2 values, the freethinking style component has a higher and stronger R2 value of (0.930).

Based on the results, the thinking styles variable has 2 dimensions "functional and orientation". The functional dimension has 4 components " analytical style, creative style, executive style, realisticstyle " and the orientational dimension has 4 components " collaborative style, critical style, free-thinking style, conservative style".

2. What is the ranking of the dimensions and components of professors' thinking styles with a psychological approach in universities of Babol City?

To determine the ranking of the dimensions and components of the faculty thinking style, the Friedman test can be used. This test allows comparison of mean changes in different situations. In order to classify and prioritize the dimensions and components, descriptive information about them

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is required. This includes key figures measures such as mean, standard deviation, upper and lower limits of the desired dimensions.

Table 8. Comparison of the mean scores of the components of professors' thinking styles with a psychological perspective

Component	Participants No.	Average	Standard Deviation	Error Standard of Mean	Statistics	DF	P	Average Differences
Analytical style	300	3.70	0.70	0.04	91.15	299	.000	3.70
Creative style	300	3.55	0.73	0.04	84.38	299	.000	3.55
Executive style	300	3.69	1.02	0.06	62.49	299	.000	3.69
Realism style	300	3.51	0.84	0.05	71.95	299	.000	3.51
Collaborative style	300	4.14	0.78	0.05	91.43	299	.000	4.14
Critical style	300	3.56	0.69	0.04	88.76	299	.000	3.56
Free thinking style	300	3.41	0.80	0.05	73.93	299	.000	3.41
Conservative style	300	3.47	0.74	0.04	81.63	299	.000	3.47

Based on the available information, the highest mean value is associated with the “Collaborative Style” component with a value of 4.14, while the lowest mean value is associated with the “Free-thinking Style” component with a value of 3.41. Further analysis is required to determine the ranking of the components of the faculty thinking style. The Friedman test can be used to go beyond raw data and make these comparisons.

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Table 9. Friedman Test Ranking of the Components of professors' thinking styles with a Psychological Approach

Friedman Test	Average	Chi-square	Standard-deviation	Significance Level	Participants	Ranking No.
Components of professors' thinking style with a psychological approach						
Analytical style	4.81					3
Creative style	4.18					5
Executive style	5.03					2
Realistic style	4.12	254.645	7	0.001	300	6
Collaborative style	6.21					1
Critical style	4.27					4
Free thinking style	3.58					8
Conservative style	3.80					7

According to the results in Table 9, the “collaboration style” component has the highest average value of 6.21 (first ranking) among the various components of faculty members thinking style. The calculated squared chi-square value is 254.635, which is below the significance level of 0.05. This indicates that the Friedman test is statistically significant and the ranking of faculty members thinking style dimensions is meaningful. When comparing the mean ranks, it can be viewed that the second and third most important components are the “Executive Style” and the “Analytical Style”, with mean ranks of 5.03 and 4.81, respectively. The “Critical Style” and “Creative Style” components take fourth and fifth place with average values of 4.27 and 4.18, respectively. The Realistic Style component ranks sixth with an average score of 4.12, while the Conservative Style component ranks seventh with an average score of 3.80. The “Free Thinking Style” component takes eighth place with a mean of 3.58.

Discussion

Universities and higher education institutions are important organizations that play a strategic role in advancing the country's goals. In universities that deal specifically with human resources, the role of professors' thinking styles is twofold, therefore, the main purpose of the current study is to identify the dimensions and components of professors' thinking styles with a psychological approach in universities of Babol City. The findings showed that professors' thinking style has 2

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dimensions "functional and orientational". The functional dimension has 4 components " analytical style, creative style, executive style, realisticstyle " and the orientational dimension has 4 components " collaborative style, critical style, free-thinking style, conservative style". The findings showed that the impact of all dimensions and components on professors' thinking styles were confirmed.

The findings of this study are consistent with the findings of (Grigorenko & Sternberg, 1995); (Mirshojaeiyan Hosseini et al., 2018), (Badamchi & Yazdani, 2023), (Shafiei Servestani et al., 2020), and (Behfar et al., 2021). Professors have the flexibility to incorporate one or a combination of these styles into their teaching and research, taking into account their individual personalities, experiences and priorities. The finding of this study indicated that professors with a psychology perspective address a wide range of thinking styles, each reflecting specific attitudes and approaches to the field of psychology. Professors with an analytical style are primarily concerned with precise thinking and deeper analysis of theories with the aim of looking at psychological concepts from different perspectives. In contrast, professors with a creative style express innovative opinions and offer creative solutions in various areas of psychology. Professors with an executive style emphasize the importance of implementing and demonstrating psychological theories in practice and everyday life. Each of these styles represents the different inclinations of professors when dealing with theories and applying them in practical contexts. This diversity of thinking styles among professors allows students to maximize their educational experiences by broadening their perspectives and gaining a better understanding of different styles.

The importance of different thinking styles among professors with a psychological perspective on education and learning can significantly improve the teaching and learning process. By incorporating different thinking styles, professors can offer students different perspectives and approaches to analyzing a topic. Using different thinking styles allows professors to interact with students more meaningfully. (khademi & Rasoli, 2021) in their study indicated that students who exposed to different perspectives and methodologies could develop a deeper understanding and mastery of psychological concepts. They also found that the presence of different thinking styles encourages students to become more confident and reflective in their thinking. The students will be confronted with different viewpoints and will be encouraged to critically evaluate and provide constructive feedback on different theories and ideas. Different thinking styles among professors

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can strengthen students' critical thinking and research skills, thereby promoting a lifelong learning process. Students are exposed to a variety of teaching methods and languages, allowing them to better understand concepts and tackle various problem-solving scenarios. Professors who use different thinking styles can present concepts in different ways and in different languages, thereby catering to students with different skills and talents. This approach provides a better understanding of the topic and allows students to approach problem solving from multiple angles.

The findings of the second question indicated a significant and positive relationship between professors' thinking styles with a psychological perspective and all dimensions and components of it. Specifically, among the various components of the thinking style of professors with a psychological approach, the “cooperation style” component achieved the highest average rank of 6.21. These results are consistent with previous studies by (Keshtegar & NastieZaie, 2021), (Shafiei Servestani et al., 2020)and (Mohammadi et al., 2020). According to the findings of this study, the professors' collaborative thinking style not only contributes to improving the teaching and learning process, but also enables students to further develop their social and professional skills. By actively participating in the learning process, students experience concentration, motivation and the opportunity to share their criticism, ideas and experiences. According to (Shafiei Servestani et al., 2020), the collaborative style encourages group activities and discussions and encourages the development of communication, collaboration, and team problem-solving skills, which are critical to success in both professional and social contexts. Furthermore, the collaborative style allows students to benefit from the diverse experiences and perspectives of their classmates, enriching the learning process and maximizing collective intelligence.

To conclude, professors’ thinking styles can play an important role in teaching and learning in universities. We believe that professors’ knowledge about cognitive/thinking styles can lead to attitudinal and behavioral changes, which in turn lead to more effective teaching and learning.

This study had some limitations such as lack of interest from some quantitative sample units in participating in the research process and completing the quantitative phase questionnaires. Another limitation of the study is that it focuses only on universities in Babol City. This restriction may limit the generalizability of the findings to a broader population or different geographical areas.

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Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the ethics committee of Islamic Azad University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection, and analysis. All authors contributed to the article and approved the submitted version.

Funding

The authors did (not) receive support from any organization for the submitted work.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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