

## **Developing a Model of Philosophical Mindset and Mindfulness on Information Processing Styles in Problem-Solving Skills of Mathematics Teachers**

**Elham Golijani Moghadam<sup>1</sup>, Mohsen Rostamy-MalKhalifeh<sup>2\*</sup>, Mohammad Hasan behzadi<sup>3</sup>**

<sup>1</sup> *PhD Student in Mathematics Education, Department of Mathematics, Science and Research*

<sup>2</sup> *Associate Professor of Data Envelopment Analysis, Department of Mathematics, Science and Research Branch, Islamic Azad University, Tehran, Iran*

<sup>3</sup> *Associate Professor of Statistics, Department of Statistics, Science and Research Branch, Islamic Azad University, Tehran, Iran.*

### **Abstract**

Information processing styles play a crucial role in mathematics teachers' problem-solving skills, as they directly impact their ability to teach effectively and address educational challenges. A precise understanding of these styles can enhance teaching methods and improve students' problem-solving skills, necessitating the development of a localized model. This article aims to formulate a model of philosophical mindset and mindfulness and examine their effects on information processing styles in mathematics teachers' problem-solving abilities. Developing this model requires an in-depth analysis to assess how philosophical beliefs, attention quality, and focus relate to problem-solving approaches. The study employs a mixed-methods approach (qualitative and quantitative) to explore, describe, interpret, and explain the research topic. Initially, qualitative interviews were conducted to identify model components. The research population comprises experts from the education departments of Districts 1, 2, and 3 in Tehran, who participated in interviews and completed a structured interpretive questionnaire. Data were analyzed using MAXQDA and ISM software. The results indicate that philosophical mindset, mindfulness, and their components significantly impact mathematics teachers' information processing styles in problem-solving. Based on these findings, practical recommendations are provided.

**Keywords:** Philosophical Mindset, Mindfulness, Information Processing Styles, Problem-Solving Skills.

---

\* Corresponding Author

ISSN: 1735-8272, Copyright © 2026 JISE. All rights reserved

## 1- Introduction

In any educational system, focusing on teachers, as the primary implementers of programs and educational initiatives, is essential for the success or failure of educational innovations. Teaching is a specialized and sensitive profession, requiring careful selection, substantial investment in recruitment, and continued support to ensure teachers are well-prepared and empowered. Teachers must be granted the necessary authority to execute educational programs and shape student development, with opportunities for active participation in policy development, curriculum design, and instructional resources (Nicolescu & Parkeck, 2015). Given the focus of this study on mathematics teachers, their unique problem-solving challenges, mental processes, and philosophical approaches are examined. Problem-solving represents a complex learning process and an inherent part of daily life. Teaching mathematics through problem-solving involves real-world issues as the starting point, which are then translated into mathematical language. This process may require iterative feedback between real-world and mathematical contexts until a mathematical solution is reached, which is then interpreted back into real-world terms. This dynamic interaction not only advances mathematics but also aids in solving progressively complex real-world problems (Painter, 2012).

For mathematics teachers to teach and solve problems effectively, a foundational mental and practical processing framework is essential. According to cognitive-experiential theory, people conceptualize the world using two primary information-processing systems: rational and experiential (or intuitive). Although individuals may utilize both styles, they operate independently and are often referred to as dual-processing systems (Dube et al., 2010). Information processing implies that, like a computer, individuals perform operations on their internal mental representations from the moment they receive sensory inputs (input phase) to the moment they respond (output phase). This sequence involves encoding, organizing, and transforming information, influenced by logic, rules, and strategies, ultimately depending on the scope of the input data (Tyler & Bugbee, 2004).

Allport introduced the concept of style to psychology in 1937, suggesting that individuals' cognitive styles could reveal their personality and behavior. Reviewing cognitive psychology studies indicates significant individual differences in cognitive aspects, including cognitive style, with theorists emphasizing specific components such as information processing, behavior (learning), and social interaction (Tyler, 2000). Rational processing requires higher cognitive resources, is analytical, verbal, conscious, and relatively slow, relying on logical inference. Experiential or intuitive processing, on the other hand, is innate, adaptive, and allows individuals to learn from experience, especially those with emotional significance, avoiding negative emotions and facilitating positive ones.

This study emphasizes the philosophical mindset of mathematics teachers in information processing. Philosophical thinking influences teachers' perspectives, approaches to problems, and cognitive tendencies, providing a broader understanding and logical decision-making framework. Developing logical thinking is essential for anyone engaged in collective activities. Mirkamali (2006) asserts that logical thinking arises from a philosophical mindset and serves as the foundation for a systematic approach to problem-solving. Smith (1965) identifies three dimensions of a philosophical mindset: comprehensiveness, depth, and flexibility. Comprehensiveness involves connecting specific instances within a broader context and relating problems to overarching goals or ideals. Depth entails questioning assumptions, discerning fundamental issues, and recognizing implicit meanings through hypothetical-deductive methods. Flexibility enables individuals to avoid psychological rigidity, critically evaluate ideas, and approach issues from multiple perspectives.

Mindfulness, rooted in Eastern traditions like Buddhism, is another cognitive intervention explored by Western researchers who adapted it for improving well-being across different societies. Mindfulness is defined as paying attention in a specific way—intentionally, in the present moment, and without judgment

(Segal et al., 2007). Through guided attention, mindfulness practices shift responses to conflicts from automatic to conscious, enhancing personal and interpersonal relationships. Schwartz (2004) emphasizes that mindfulness practices foster awareness in challenging situations, expanding one's perspective and response to life's constant changes.

In summary, a philosophical mindset represents an individual's general approach to life and issues, while mindfulness provides a mental discipline centered on present awareness, potentially impacting information processing styles. Limited research has explored the direct impact of philosophical mindset on information processing styles and problem-solving skills, particularly in mathematics education, where problem-solving is crucial. This study addresses several gaps: how a philosophical mindset influences teachers' problem-solving and instructional approach, how mindfulness could positively affect teachers' information-processing styles, and how teachers with a strong philosophical mindset and mindfulness could ultimately enhance student problem-solving skills. Despite previous studies examining these factors separately, a cohesive framework that integrates their influence on information processing and problem-solving among mathematics teachers is lacking. Additionally, there is a shortage of quantitative and empirical data to objectively measure these influences on teachers' styles and problem-solving abilities.

## **2- Literature Review**

### **Philosophical Mindset:**

A philosophical mindset is defined as the capability of the mind, a way of thinking, the product of thought, or a conceptual image. More comprehensively, a philosophical mindset is a force that combines focused thinking with sensitivity to perception and a connection between them, aiming to understand truths. Like a philosophical spirit, it has characteristics evident in a philosopher's behavior, way of thinking, approach to others, and handling of problems, affecting all aspects of their life and distinguishing them from others. It encompasses three dimensions: breadth, depth, and flexibility (Shariatmadari, 2015).

According to Smith, a person with a philosophical mindset has a strong desire for knowledge, coupled with cautious consideration of their beliefs. This individual possesses a logical mind and a habit of thinking correctly. The habit of thoughtful and accurate judgment and the ability to apply it in life can be referred to as a philosophical mindset. It shapes character, comprising habits, attitudes, and values guided by sound thinking and judgment (Bikzad & Dadkhah, 2012).

A philosophical mindset is a force combining focused thought with perceptive sensitivity, aiming to comprehend truths. It includes a person's abilities and readiness for sound judgment and values and the habit of creative thinking (Smith, 2000).

The philosophical mind of an individual can be understood through their way of thinking, approach to issues, and cognitive characteristics, which are reflected in various aspects of their behavior (Javadipour et al., 2016). Mirkamali believes that a philosophical mind prepares an individual to recognize phenomena through correct and logical thinking.

Sharafi interprets the philosophical mind as philosophical thinking and attributes three functions to it:

1. Theoretical function: helping individuals find a framework for their thoughts and organize them systematically.
2. Analytical function: enabling individuals to reinterpret concepts and terms.

3. Prescriptive function: establishing appropriate criteria for evaluating what ought to be and what ought not (Heydari et al., 2017).

A philosophical mindset is a type of intellectual character that enhances individuals' evaluative judgments and provides teachers with the knowledge and insight to approach scientific and educational issues accurately. It enables them to create learning opportunities, design educational materials to foster an optimal learning environment, and thereby promote comprehensive thinking and overall development in students.

### **Mindfulness:**

Mindfulness has roots in ancient times and can be found in both Western and Eastern cultures. The term "mindfulness" is a translation of the Pali word *Sati* in the Buddhist sacred language, meaning awareness, attention, and recollection.

Jon Kabat-Zinn, who first used mindfulness in psychotherapy, describes it as a specific kind of attention: attention in the present moment, with as much openness as possible, without automatic reactions or biases (Shirazi, 2013). Mindfulness involves observing inner and outer stimuli as they occur, without judgment or preconceived notions. It is, in fact, a skill that allows individuals to perceive events in the present moment with less distress (Kabat-Zinn, 2005).

Kabat-Zinn defines mindfulness as a way of paying attention in a specific manner: deliberately, in the present moment, and non-judgmentally. Mindfulness helps us understand that negative emotions may arise, but they are not permanent parts of our personality. It enables individuals to respond thoughtfully to events instead of reacting impulsively (Reynolds, 2010, Nozari et al., 2025).

Mindfulness is a fundamental skill taught in cognitive-behavioral therapy, allowing individuals to become aware of their thoughts and emotions and enhance their well-being. Parrish (2010) describes mindfulness as a method that enables self-mastery and self-restoration, calling attention to our scattered minds and integrating them so that we can be present in every moment of life, free from the past and future.

Mindfulness is not merely a technique but can be considered a way of "being" or a way of "understanding" involving personal self-awareness (Baer, 2013). In mindfulness practice, individuals are taught to observe their thoughts and feelings. Prolonged observation of unpleasant private events over time reduces emotional avoidance of previously intolerable inner stimuli. Mindfulness makes it possible to observe beliefs without accepting them as truth, allowing for a wider range of responses and replacing automatic responses with conscious choices. In response to thoughts, awareness and acceptance of them are maintained, followed by redirecting attention to the breath, along with implicit changes in the patterns from which these thoughts originate (Mars & Waby, 2010).

### **Information Processing Styles:**

Information processing styles are crucial components of cognition, including memory, sensory perception, understanding, and information transmission (Esko et al., 2015). In the process of behavioral inhibition and activation, the processing system acts as an integrated whole, with all background factors—such as memory, talent, neural pathways, processing speed, executive functions, and others—contributing to the final formation of choices or behaviors (Shokat et al., 2018). Generally, the ways individuals process information received from the environment are known as processing styles (Cassidy et al., 2016). Based on the Cognitive-Experiential Self-Theory, the world is conceptualized through two information-processing systems: rationalism and experientialism (Cardillo et al., 2017). Rationalism demands higher levels of cognitive resources and is typically verbal, analytical, conscious, and relatively slow, whereas experientialism is intuitive and adaptive, allowing us to learn from experience (Tavakoli et al., 2020).

According to the Dual-Process Theory of Information Processing (Epstein, 1999), there are two types of systems for processing information:

1. The intuitive or perceptual (heuristic) system (Type 1), in which an individual's judgment and decision-making are influenced by emotions and affect decision-making outcomes; it has a significant impact on scientific realism through its relationship with philosophy of mind (Ren, 2019).
2. The analytical system (Type 2), where judgment and decision-making are unaffected by emotions, and logic and reasoning play a central role.

Epstein's Cognitive-Experiential Theory (1996) posits that individuals operate using two distinct but interactive systems: rational and experiential. The rational system is characterized as analytical, reasoning-based, deliberate, effortful, and slow, consciously learning through logical and principled connections, while the experiential system is intuitive, based on pleasurable-painful emotional experiences, processing automatically, effortlessly, and quickly, and learning unconsciously.

People's tendency to use either of these systems depends on factors such as knowledge, experience, and expertise. For example, individuals with more knowledge and expertise are likely to use analytical processing, while those with less knowledge and expertise may rely on emotions and feelings for judgment and decision-making (Isbell et al., 2013; Hastinger et al., 2016).

Analytical processes are used for novel and complex issues, while perceptual or heuristic processes are useful for daily, routine choices. Theories on analytical and heuristic thinking rely on the concept of dual processing, which highlights two interactive and parallel thinking systems. The analytical style is cognitively oriented, highly dependent on resources, and time-intensive, while the perceptual and heuristic system is influenced by affect and efficiency. However, both systems yield positive outcomes: the analytical style, due to its logical reasoning and reduced biases, contributes to effective decision-making, whereas the perceptual and heuristic style is beneficial in expertise and efficiency in solving daily issues (Swan, Schubert, Lone, & Pollard, 2015).

### **3- Research Methodology**

This study is a mixed-methods research approach (qualitative and quantitative) aimed at discovering, describing, explaining, and clarifying the research topic. Initially, a literature review is conducted using documentary and library methods, critically reviewing accessible and reputable scholarly literature, including articles, theses, books, and academic databases, to identify factors impacting the research topic. Subsequently, qualitative methods will be employed to finalize and localize the extracted categories. In other words, this research is a mixed approach in terms of data type. In terms of model presentation, it is a qualitative and applied study, and concerning the examination of variable relationships and testing the model developed in the first stage, it is a quantitative and applied study with practical implications once variable relationships are tested. Paradigmatically, it adopts a constructivist (interpretive) approach in the qualitative dimension and a positivist approach in the quantitative dimension. This research is applied in terms of determining influential factors and descriptive in identifying relationships among variables. The research is also cross-sectional in terms of time horizon.

The research strategy, from a qualitative perspective, is grounded theory, as the research path involves interviewing individuals, identifying relevant concepts, and modeling them. Grounded theory is a method aimed at understanding and interpreting individuals' experiences of events within a specific context (Strauss and Corbin, 2016). This study is applied-developmental in nature. The research is conducted in three stages:

- **Stage One:** In this stage, data collection is done through structured interviews with experts from the Education Department.
- **Stage Two:** In the second stage, following the necessary approvals, all interviews were conducted, transcribed verbatim, and imported into the MAXQDA software in Word format. Coding was then applied to the data, and using the structured model of Strauss and Corbin, a corresponding model was developed.
- **Stage Three:** In the final stage, the extracted model was tested quantitatively. To construct the theory in the first stage, grounded theory methodology was used, followed by quantitative testing of the relationships between theoretical elements in the second stage.

The data collection methods in this research are divided into two categories: library and field. For gathering information related to the literature and research background, library methods were employed, while field methods were used for gathering information to provide a localized model. In the quantitative section of this study, data collection tools include interviews and a researcher-designed questionnaire.

#### 4- Data Analysis

Since the purpose of this study is to develop a model of philosophical mindset and mindfulness regarding information processing styles and problem-solving skills among mathematics teachers, the data analysis for this section focuses on qualitative findings. Specifically, the required variables for the research model are extracted from the interviews, and the relationships among these variables are determined.

In conducting the data analysis, the research validity was initially assessed using Lincoln and Guba's method (1980), and the reliability was evaluated through the internal agreement method. Descriptive statistics of the interviewees were then presented, followed by data analysis to extract codes, categories, and their interrelationships, using the MAXQDA software.

For examining research validity, this study utilized the Lincoln and Guba method (1980), which is structured around four criteria transferability, credibility, dependability, and confirmability confirming the validity of the research instruments. Research Validity is shown in Table 1.

Table 1: Research Validity According to Lincoln and Guba's Method (1980)

Indicator	Process
Transferability	Surveying experts who did not participate in the present research.
Credibility	Spending sufficient time on the research and validating interview data with the interviewees.
Confirmability	Documenting and adhering to all steps taken in the research, with records of the research process.
Dependability	Recording all details and taking thorough notes during the interview phase.

To evaluate the reliability of the research, two individuals who were outside the research topic were asked, after providing necessary explanations and training, to code five of the interviews so that the level of reliability could be measured and compared.

Table 2: Research Reliability Using the Internal Agreement Method

<b>Interview</b>	<b>Number of Codes Extracted from the Interview</b>	<b>Number of Agreements</b>	<b>Percentage of Consensus or Reliability Test</b>
Interview 1	43	37	86.05%
Interview 4	51	42	82.40%
Interview 5	37	30	81.10%
Interview 9	34	25	73.53%
Interview 11	28	23	82.10%

As shown in the table above, the internal agreement level for the five interviews is above 70%, indicating an acceptable reliability for the conducted interviews and the codes extracted by the researcher.

The participants in the research include experts from the Education Department in districts 1, 2, and 3 of Tehran. The demographic characteristics of the interviewees, including gender, education level, and last name, are presented in the table 3.

Table 3: Demographic Characteristics of Interviewees

<b>Row</b>	<b>Gender</b>	<b>Education Level</b>	<b>Work Experience</b>
1	Male	Master's Degree	30 years
2	Female	Master's Degree	32 years
3	Male	Doctorate	25 years
4	Male	Bachelor's Degree	29 years
5	Male	Master's Degree	27 years
6	Male	Master's Degree	26 years
7	Male	Doctorate	24 years
8	Female	Doctorate	20 years
9	Male	Master's Degree	19 years
10	Female	Master's Degree	26 years

11	Male	Master's Degree	25 years
12	Male	Master's Degree	30 years
13	Female	Master's Degree	26 years
14	Male	Master's Degree	24 years
15	Male	Bachelor's Degree	23 years

In order to extract the necessary variables for the research model in solving problems in the experts' work area, multiple methods are employed. These methods can be categorized in various ways. One common way is to categorize these methods based on how knowledge is obtained from the expert. Accordingly, there are two categories: direct extraction and indirect extraction of knowledge. Direct methods directly request the expert to explain how the work is done. A prerequisite for these methods to be successful is that the expert has sufficient ability and willingness to share their knowledge. In this method, information is easily articulated by the expert, except in cases where the expert has repeated the task so often that the information seems obvious to them. Indirect methods are employed to obtain information that cannot easily be expressed by the expert. Additionally, the classification of methods can also be based on the type of information they provide, which will be referenced in this section. In this research, a direct method has been used, and after conducting interviews to understand and extract the necessary variables, these concepts were first subjected to open coding, then categorized, and finally axial coding was conducted to extract the research pattern. An example of interviews gathered from respondents, which were reviewed and extracted as follows:

The components of philosophical mindset include three main components:

1. **Depth (Cognitive Breadth):** This component refers to the ability to view issues from various angles while considering all aspects and consequences. A person with cognitive depth can understand complex concepts and analyze them through various approaches.
2. **Flexibility (Cognitive Fluidity):** Mental flexibility refers to an individual's ability to change perspectives and accept new ideas and opinions. A person with mental flexibility can alter their viewpoints in the face of new or contradictory situations and arrive at more creative solutions.
3. **Holistic View:** This component refers to the individual's ability to see the whole of a problem and relate its various parts. In this perspective, instead of focusing on details, the individual looks at the entire system or problem and better understands the relationships between components.

The components of mindfulness can be generally divided into five main components through which states of awareness and attention to the present moment can be described:

1. **Observation:** The ability to observe and be aware of internal and external events and experiences without judgment. This component means paying attention to the environmental and internal details.
2. **Description:** The ability to name and accurately describe one's feelings, thoughts, and experiences. This component helps individuals better understand and articulate their feelings and experiences.

3. **Acting with Awareness:** This component refers to performing actions with full attention to the present moment. In this state, the individual is aware of their behavior and does not act automatically or thoughtlessly.
4. **Non-judgment:** Mindfulness encourages individuals to refrain from quick and automatic judgments about their thoughts, feelings, and experiences. In this state, the individual accepts their feelings and thoughts as natural experiences, not necessarily positive or negative.
5. **Non-reactivity:** The ability to observe thoughts and feelings without an immediate reaction to them. This component refers to creating a space between experience and response.

By examining the interview data, the extraction of other concepts has also been conducted in the same manner. This process is fully illustrated in the table below.

Table 4: Open Coding Process of Interviews with Experts

Row	Code	Frequency
1	Holism	7
2	Depth	10
3	Flexibility	6
4	Observation	6
5	Description	12
6	Acting with Awareness	5
7	Non-judgment	7
8	Non-reactivity	6
9	Intuitionism	9
10	Rationalism	11
11	Problem Solving in Mathematics	7

As seen in the Table 4, 11 components were identified from the interviews as the model of philosophical mindset and mindfulness regarding information processing styles in problem-solving skills. The highest frequency corresponds to "Description" with 12 occurrences, while the lowest is related to "Acting with Awareness" with 5 occurrences.

The next step after identifying and extracting codes from the interviews is to determine the categories and summarize the concepts. In this section, based on the concepts of the codes, the main categories or dimensions of the model have been established.

Table 5: Concepts and Themes Derived from Qualitative Data

Components	Themes
------------	--------

Philosophical Mindset	Comprehensive
	Depth
	Flexibility
Mindfulness	Observation
	Description
	Action with Awareness
	Non-judgment
	Non-reactivity
Information Processing Styles	Intuition
	Rationality
	Mathematical Problem Solving

In Table 5, the results of converting conceptual codes into themes are presented, which are also mentioned as indicators in the model.

### 5- Achieving Theoretical Sufficiency

As explained in Chapter Three, the data collection process continues until the researcher reaches the saturation point in the data, where the concepts related to the phenomenon of interest, raised by different interviewees, become repetitive and no new information is added to the model. The Table 6 illustrates how this criterion is achieved in the current research:

Table 6: How Theoretical Sufficiency is Achieved

Interview Code	Frequency of Open Codes	Number of Concepts	Completion of Previous Concepts	Emergence of New Categories	Completion of Previous Categories
Universality	83	45	-	11	-
Depth	62	61	16	3	2
Flexibility	69	67	6	-	1
Observation	48	69	2	-	-
Description	52	74	5	-	-
Action with Awareness	51	77	3	-	-
Non-judgment	49	80	3	-	-
Non-reactivity	37	81	1	-	-

Intuition	44	83	2	-	1
Rationality	47	83	-	-	-
Mathematical Problem Solving	53	85	2	-	-

The output of MAXQDA software is shown in Figure 1.

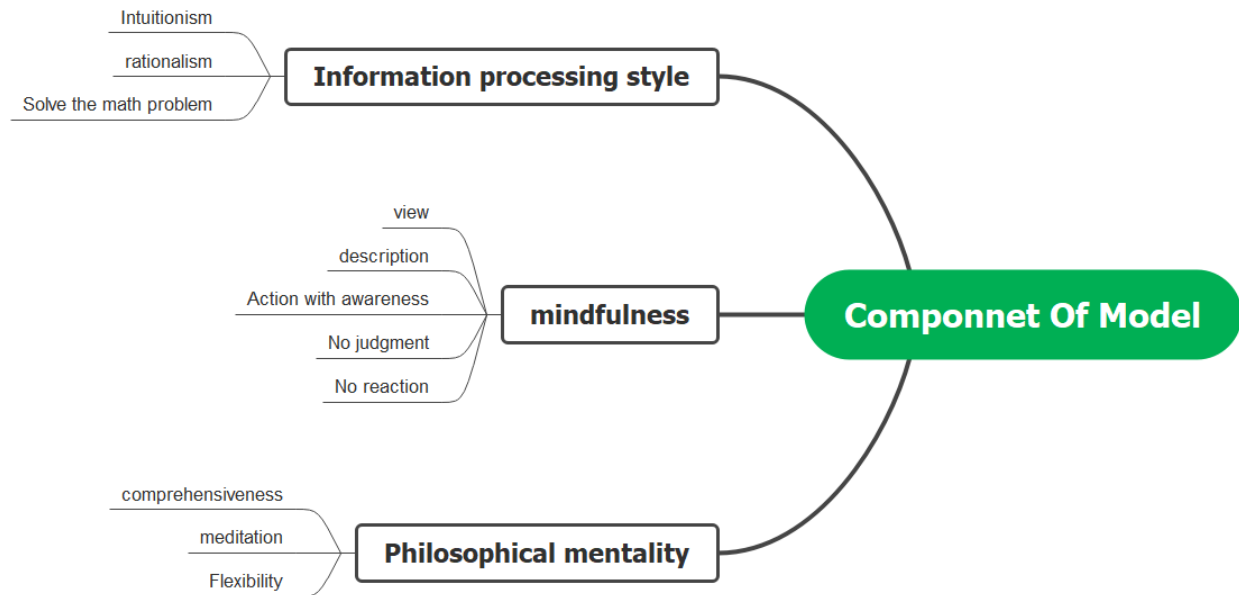


Figure 1: Output of MAXQDA software regarding the overall related factors.

Subsequently, a structural-interpretive questionnaire model was designed and distributed among experts, and the results of the structural-interpretive analysis are discussed below.

### Structural-Interpretive Modeling (ISM)

To start, a 4x4 matrix of indicators was developed to form the structural interaction matrix. This matrix was provided to the managers, who completed it according to the following principles:

- **V:** Variable *iii* helps in achieving variable *jjj*.
- **A:** Variable *jjj* is improved only by variable *iii*.
- **X:** Variables *iii* and *jjj* help each other in achieving their goals.
- **O:** Variables *iii* and *jjj* are not related.

Based on the entries in the SSIM (Structural Self-Interaction Matrix):

- If  $(i,j)(i,j)(i,j)$  is marked as **V** in the SSIM, then in the reachability matrix,  $(i,j)(i,j)(i,j)$  is set to 1 and  $(j,i)(j,i)(j,i)$  is set to 0.

- If  $(i,j)(i, j)(i,j)$  is marked as **A** in the SSIM, then in the reachability matrix,  $(i,j)(i, j)(i,j)$  is set to 0 and  $(j,i)(j, i)(j,i)$  is set to 1.
- If  $(i,j)(i, j)(i,j)$  is marked as **X**, then in the reachability matrix, both  $(i,j)(i, j)(i,j)$  and  $(j,i)(j, i)(j,i)$  are set to 1.
- If  $(i,j)(i, j)(i,j)$  is marked as **O**, then both  $(i,j)(i, j)(i,j)$  and  $(j,i)(j, i)(j,i)$  are set to 0.

The reachability matrix is constructed using the structural interaction matrix as outlined above. The matrix transformation follows the rules:

- For **V**:  $(i,j)=1(i, j) = 1(i,j)=1$  and  $(j,i)=0(j, i) = 0(j,i)=0$
- For **A**:  $(i,j)=0(i, j) = 0(i,j)=0$  and  $(j,i)=1(j, i) = 1(j,i)=1$
- For **X**:  $(i,j)=1(i, j) = 1(i,j)=1$  and  $(j,i)=1(j, i) = 1(j,i)=1$
- For **O**:  $(i,j)=0(i, j) = 0(i,j)=0$  and  $(j,i)=0(j, i) = 0(j,i)=0$

Using these relationships, the reachability matrix shown in Table 7 is created.

Table 7: Reachability Matrix

	A	B	C	D
A	1	1	0	0
B	0	1	1	1
C	0	1	1	1
D	1	0	1	1

With the reachability matrix obtained, two sets, namely the reachability set and the antecedent set, are defined to determine the criteria. The intersection of these sets is then computed. The reachability set is defined as the set where the row entries of the criteria are represented as one, and the antecedent set is defined as the set where the column entries of the criteria are represented as one. According to the transitivity property in mathematical logic, if  $(i,j)=1(i, j) = 1(i,j)=1$  and  $(j,k)=1(j, k) = 1(j,k)=1$ , then  $(i,k)=1(i, k) = 1(i,k)=1$ . This means that criteria indirectly affect each other. The relationship between two variables that connect after applying this logic is represented as 1.

Table 8: Modified Reachability Matrix (Final Reachability Matrix)

	A	B	C	D
A	1	1	1	1
B	1	1	1	1
C	1	1	1	1
D	1	1	1	1

In Table 8, considering the transitivity relationship, if iii and jjj are related and kkk and jjj are related, then iii and kkk are also related. Consequently, some entries will be converted to 1. Additionally, the matrix is divided into various levels using the following method to determine the reachability and antecedent sets for each criterion. The reachability set is defined as the set where the row entries of the criteria are represented as one, while the antecedent set is the set where the column entries of the criteria are represented as one. By obtaining the intersection of these two sets, the next column of the table (Intersection) will be completed. The first row where the intersection of the two sets equals the reachability set will determine the first priority level.

Based on the evaluations conducted in the table and figures above, and using the prioritized levels of criteria and the reachability matrix, the final matrix of driving power and dependence is constructed. In this matrix, the largest number is assigned the highest rank, and the smallest number is assigned the lowest rank. The final reachability matrix must be categorized into different levels. For determining the level of variables in the final model, three sets—output, input, and intersection are formed for each variable. In the first table, variables whose intersection of output and input sets is identical are considered as common set variables in the hierarchical process, meaning these variables do not affect the creation of any other variables. After identifying these variables, they are removed from the list of other variables. This process continues until all variables' levels are determined. In this study, six levels of variables were obtained in thirteen tables, and the final results are summarized in Table 3. Research indicators whose output and intersection sets are completely identical are placed at the highest level in the structural-interpretive model hierarchy. The First Stage of Level Determination in ISM Hierarchy is shown in Table 9.

The groups depicted are defined as follows:

- **Group 1:** Criteria that have weak power and weak dependence. These variables are almost independent from the system, as they have weak connections with it. In the sample examined, no variables fall into this group.
- **Group 2:** Variables that have weak power but strong dependence.
- **Group 3:** Variables that have both strong power and strong dependence.
- **Group 4:** Variables that have strong power but weak dependence.

Table 9: First Stage of Level Determination in ISM Hierarchy

Level	Intersection	Input Set	Output Set	Criteria
First	2.5.8	2.3.5.7.8.9	5.8.2	Mindfulness
First	2.7.9	1.2.4.5.6.7.8.9	2.7.9	Philosophical Mindset
Second	2.3.8	2.3.4.7.8.9	1.2.3.6.8	Information Processing Styles

In the last column, the levels are specified in such a way that if the intersection of the attainable set and the antecedent set is equal to the attainable set, the corresponding variable is placed at the highest level in the ISM matrix hierarchy. In the ISM graph, the reciprocal relationships and influences between the criteria and the connections between the criteria at different levels are revealed, which leads to a better understanding of the decision-making space. The results of the variable ranking are shown in the Figure 2:

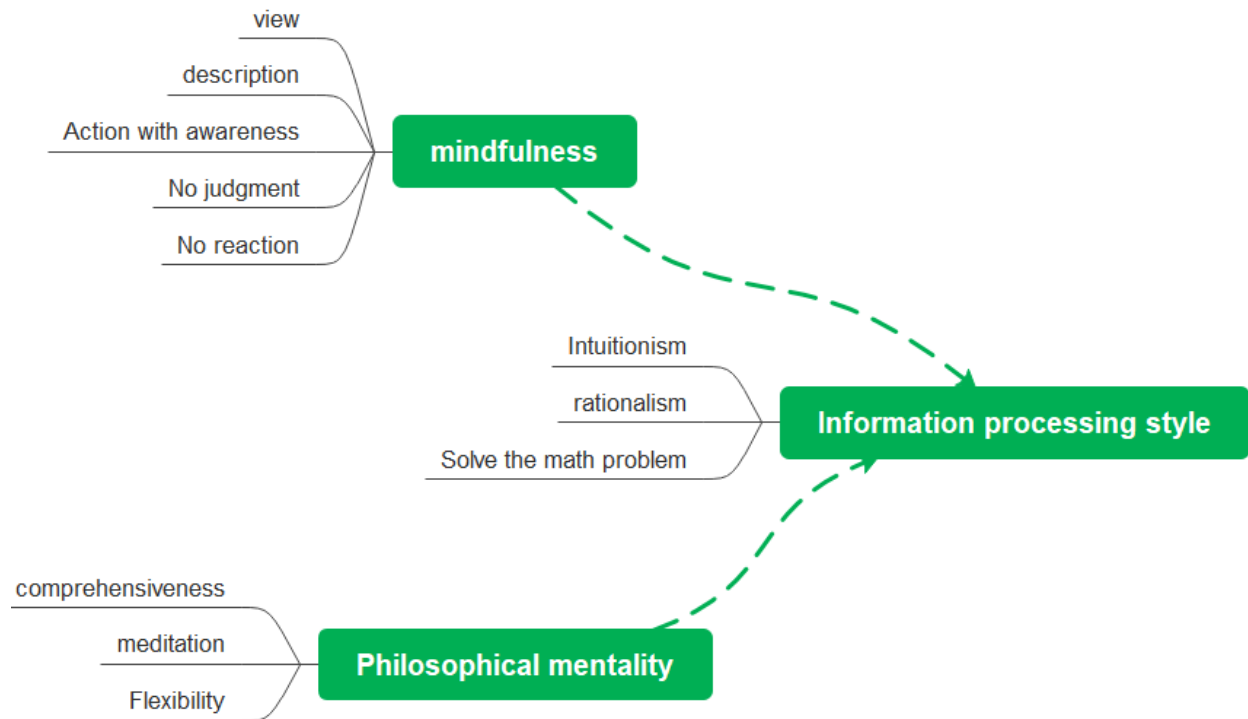


Figure :2 Structural-Interpretive Model Design

## 6- Conclusion

The findings of this study indicate that both philosophical mindset and mindfulness play complementary roles in improving mathematics teachers' information processing styles and problem-solving skills. A philosophical mindset encourages teachers to adopt deep, flexible, and holistic patterns of thinking, enabling them to examine mathematical problems from multiple perspectives and generate innovative solutions beyond conventional approaches. Such characteristics strengthen analytical reasoning, creativity, and adaptability, allowing teachers to select appropriate instructional strategies and guide students toward a deeper conceptual understanding of mathematics. By emphasizing critical reflection rather than routine procedures, a philosophical mindset promotes more effective knowledge construction and supports higher-quality mathematical reasoning.

Mindfulness contributes to this process by enhancing sustained attention, emotional regulation, and non-judgmental awareness during mathematical problem-solving. Teachers with higher levels of mindfulness are better able to concentrate on complex tasks, minimize distractions, and approach challenges with greater calmness and confidence. Furthermore, mindfulness reduces anxiety associated with difficult mathematical problems while encouraging individuals to view mistakes as valuable learning opportunities rather than failures. These characteristics improve working memory, systematic information processing, and accurate analysis, all of which are essential for solving multi-step mathematical problems and maintaining effective classroom performance.

The combined influence of philosophical mindset and mindfulness provides a comprehensive framework for improving teachers' cognitive and instructional effectiveness. While philosophical thinking expands the capacity for critical analysis, creativity, and flexible reasoning, mindfulness strengthens attention, emotional stability, and cognitive control throughout the problem-solving process. Together, these two

constructs enable teachers not only to process information more efficiently but also to model reflective thinking, resilience, and effective decision-making for their students. Consequently, students are more likely to develop stronger analytical abilities, greater confidence in solving mathematical problems, and improved academic achievement through exposure to these teaching practices.

Despite these valuable findings, several limitations should be acknowledged. The limited availability of previous research, the restricted generalizability of the sample, reliance on self-reported questionnaire data, and possible response bias may have influenced the results. Future studies should investigate these relationships across different educational contexts using more diverse research designs, including longitudinal and experimental approaches. In addition, professional development programs that integrate philosophical thinking with mindfulness practices may provide an effective strategy for enhancing teachers' information processing styles, strengthening mathematical problem-solving abilities, and ultimately improving the overall quality of mathematics education.

## References

Baer, R. A. (2013). *Mindfulness-based treatment approaches: Clinician's guide to evidence base and applications* (2nd ed.). San Diego: Academic Press.

Bikzad, J., & Dadkhah, A. (2012). *Philosophical mindset and the development of creative thinking in teachers*. Tehran: Roshd Publishing.

Cardillo, G., Epstein, S., & Pacini, R. (2017). *Cognitive-experiential self-theory and the dual-process model of information processing*. New York: McGraw-Hill.

Cassidy, S., & Gregory, R. (2016). Information processing styles and academic performance. *Educational Psychology*, 38(1), 12-29.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Delavar, A. (2017). *Research methods in humanities and social sciences*. Tehran: Virayesh Publishing.

Epstein, S. (1999). Cognitive-experiential self-theory: A dual-process model of information processing. In L. Pervin & O. John (Eds.), *Handbook of personality: Theory and research* (pp. 159-184). New York: Guilford Press.

Heydari, M., Javadi Pour, M., & Colleagues. (2017). The concept of philosophical mindset and its effects on students' learning. Tehran: Roshd Publishing.

Javadi Pour, M., Shafiei, S., & Heydari, M. (2016). Analysis of philosophical mindset in the education system of Iran. *Journal of Educational Research*, 12(3), 45-67.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.

- Lincoln, Y. S., & Guba, E. G. (1980). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.
- Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.
- Mohammadi, J. (2018). *Qualitative data analysis in humanities using MAXQDA*. Tehran: University of Tehran Press.
- Nasrollahi, M. (2016). Foundations of qualitative methodology in educational research. *Journal of Educational and Social Research*, 14(2), 89-105.
- Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches (7th ed.)*. Boston: Pearson Education.
- Nozari, H., Abdi, H., & Szmelter-Jarosz, A. (2025). Goat optimization algorithm: a novel bio-inspired metaheuristic for global optimization. arXiv preprint arXiv:2503.02331.
- Sadeghi, M., & Nikpour, L. (2014). *Application of qualitative and quantitative methods in educational sciences*. Tehran: Samt Publishing.
- Shariati, A. (2015). *Philosophical foundations of education*. Tehran: Tarbiat Modares University Press.
- Shirazi, S. (2013). *Mindfulness and psychotherapy*. Tehran: Dayereh Publishing.
- Strauss, A., & Corbin, J. (1998). *Basics of qualitative research: Techniques and procedures for developing grounded theory (2nd ed.)*. Thousand Oaks, CA: SAGE Publications.
- Strauss, A., & Corbin, J. (2016). *Foundations of qualitative theorizing: Data analysis methods in qualitative research (M. Bazargan & A. Moghadam, Trans.)*. Tehran: Ney Publishing.
- Swan, A. P., Schubert, D., & Pollard, D. (2015). Analytical thinking versus heuristic thinking: Decision-making under conditions of uncertainty. *Decision Sciences*, 46(4), 883-906.
- Tashakkori, A., & Teddlie, C. (2010). *SAGE handbook of mixed methods in social & behavioral research (2nd ed.)*. Thousand Oaks, CA: SAGE Publications.
- Wabi, M. R., & Mars, R. (2010). Mindfulness and cognitive processing. *Journal of Cognitive Therapy*, 24(4), 325-342.