



## Scientific Thinking and Its Obstacles

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### Abstract:

Scientific thinking is considered one of the most important means of dealing with contemporary changes and the vast knowledge revolution. It is a method for exploring the universe and a way to reach and utilize knowledge. It also helps individuals to provide scientific evidence and proofs to support their opinions. It can be regarded as the hammer with which we can knock on the door of prosperity and progress. We relied on the descriptive and analytical approach to address this research. We reached many results, the most prominent of which is that scientific thinking is a mental approach based on strong scientific foundations for solving problems, forming personal opinions, or making specific decisions. Despite its great effectiveness in achieving useful scientific results, it faces many different obstacles that prevent it from achieving its desired goal.

**Key words:** Scientific thinking; Knowledge revolution; Scientific evidence; Solving problems

الملخص:

يعتبر التفكير العلمي من أهم الوسائل في التعامل مع التغيرات المعاصرة والثورة المعرفية الكبيرة، فهو أسلوب للبحث في الكون وطريقة للتوصل إلى المعارف واستخدامها، كما يساعد الإنسان على تقديم الأدلة والبراهين العلمية على صحة آرائه، ويمكن اعتباره المطرقة التي نستطيع أن ندقّ بها باب الازدهار والتقدم، و قد اعتمدنا في معالجة هذا الموضوع على المنهج الوصفي و المنهج التحليلي، و توصلنا إلى العديد من النتائج أبرزها أن التفكير العلمي منهج فكري يبني على أسس علمية قوية لحل المشاكل أو بناء رأي شخصي أو اتخاذ قرار معين، و رغم فعاليته الكبيرة للوصول إلى نتائج علمية مفيدة إلا أنه يواجه العديد من العوائق المختلفة التي تحول دون تحقيق هدفه المنشود.

الكلمات المفتاحية: التفكير العلمي؛ الثورة المعرفية؛ الأدلة العلمية؛ حل المشاكل

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## INTRODUCTION

Thinking, in general, is one of the essential mental processes that humans have practiced since God created them. Humans are thinking beings, which distinguishes them from other creatures. Without the process of thinking, humans would not be able to perceive what is within themselves and what is around them in the universe, nor would they be able to adapt to their surrounding environment. Developing thinking is one of the top priorities in learning in general, Scientific thinking is not an end in itself but a means to discover facts, concepts, and scientific laws and to provide more knowledge. The movement of scientific research will not stop; it will continue to multiply, leading to technological leaps in the future, all of which depend on scientific thinking (Al-Hamdani, 2006, pp. 311-312).

Moreover, scientific thinking helps law students present evidence supporting their opinions and enables them to prove or disprove certain facts (Saleh, 2010, p. 28). It also trains students to arrange and organize their thoughts and present them coherently and logically, accustoming them to the legal writing style based on precision, brevity, and clarity, steering them away from superficiality and the familiar narrative style (Saleh, 2010, p. 25). Through scientific thinking, students learn to take responsibility and train in scientific honesty in researching information themselves and understanding it accurately instead of memorizing it, which fosters a love for scientific work and dedication to it (Saleh, 2010, p. 28).

Despite the importance of scientific thinking in addressing issues and solving problems, some societies, especially developing countries, still ignore the importance of science and scientific thinking due to obstacles that hinder science and scientific thinking in general, and particularly in the Arab world (Al-Hamdani, 2006, p. 312).

### Study problem

The problem of the study can be formulated in the following main question:

**What is scientific thinking? What are the main obstacles that often hinder the direct connection between humans and the world, which continue to distort the image of scientific knowledge to this day?**

To thoroughly explore the topic, this research paper is divided into two sections:

1. The Nature of Scientific Thinking
2. Obstacles to Scientific Thinking

## 1. The nature of scientific thinking

Any society that aspires to be a scientific and technological power must have its people think scientifically. Otherwise, that society will become a consumer of the scientific and technological outputs of other societies, economically dependent on them, which may reduce the development opportunities available to it. However, this does not mean that every country must prepare and train large numbers of scientists and technologists as much as it means that these scientists must be capable of practicing scientific thinking in all their activities (Al-Jamal, 1997, pp. 12-13), which we will address in this section by clarifying its concept and the various features that distinguish it, which can be used to measure all types of human thinking to determine their validity and scientific nature (Melhem, 1993, p. 59).

### 1.1 The Concept of Scientific Thinking

The concept of scientific thinking suffers from a clear confusion in determining its nature and components, with some considering it synonymous with logical thinking, while others confuse it

with the scientific method or scientific literature. Some writings even suggest that scientific thinking is closely related to or synonymous with terms like problem-solving, critical thinking, scientific processes, scientific attitudes, the scientific method, and others (Al-Jamal, 1997, p. 13). Therefore, this requirement will clarify the definition of scientific thinking and determine its types.

### 1.2 Definition of Scientific Thinking

The scientific thinking, we refer to does not focus on a specific specialized problem or even on a set of defined problems that scientists address. It does not require knowledge of a scientific language or special mathematical symbols, nor does it necessitate that one's mind be filled with scientific information or trained in research leading to solving natural human world problems. Instead, what we are discussing is that type of organized thinking which we can use in our daily lives or in the activities we engage in to perform our usual professional tasks or in our relationships with people and the surrounding world (Zakaria, 2004, p. 05).

scientific thinking is defined as a systematic method or approach that can be used in our daily lives. It is not specialized thinking in a specific subject but can be directed at addressing all topics. It does not have its own language or specific terms and is based on organizing thoughts based on several logical or non-logical principles (Mohamed, 2013, p. 10).

It is also defined as a symbolic, logical, voluntary mental process that is not directly perceived but inferred from its effects. It is stimulated when facing a particular problem and arises from the interaction of live sensory experience with past experiences in a way that enables understanding and interpreting the elements of the problem (phenomenon), leading to its solution (Saleh, 2010, pp. 25-26).

Thus, scientific thinking is a conscious, voluntary process through which a method is reached that has become significantly associated with scientific studies. It begins with intentional, organized observation of a phenomenon, followed by forming a preliminary interpretation in the form of a hypothesis that is verified through experimentation. It then uses multiple partial laws and combines them into a single theory or may resort to intellectual deduction (Joudat Shakir, n.d.).

Therefore, it becomes clear that all the previous definitions agree that scientific thinking takes several forms, including:

- Knowing and studying specific alternatives to solve a problem.
- Sifting and extracting information to make learning possible and deciding what should be learned.
- Understanding and evaluating their importance and validity to comprehend the significance and relationships between things.
- Understanding humans and their behaviors.
- Asking questions, planning for the future, and anticipating results.
- Making decisions according to a studied and planned course.

It is clear that it is difficult to set clear boundaries between these forms of thinking, as thinking is a complex and intricate process that involves various mental abilities and skills, depending on the necessity and the situations requiring the use of these different skills. Thus, the process of scientific thinking aims to achieve new results (which may be intended, especially in social sciences) (Marah, pp. 50-51).

### 1.3 Types of Scientific Thinking

There are two types of scientific thinking: deductive thinking and inductive thinking, and each type differs from the other in several aspects.

#### 1.3.1 Deductive Thinking

Deductive scientific thinking is the type of reasoning that moves from the whole to the part, that is, the comprehensive study of a particular phenomenon leading to its details. Deduction is any reasoning where the conclusion does not exceed the premises from which the reasoning is formed. In

every deductive argument, the conclusion is always equal to or smaller than its premises. For example, (Abdelkader, 2009-2010, pp. 60-61):

- Ahmed is a human... the minor premise.
- Every human dies... the major premise.
- Ahmed dies... the conclusion.

In this example, we notice that the conclusion is smaller than the preceding premises, as it concerns a specific individual, Ahmed, while the premise that "every human dies" applies to all individuals. Here, we see that the thinking went from the general to the specific, from the whole to the part, from the general principle to the specific application of the principle.

In the previous example, the conclusion was smaller than the premises.

An animal is either mute or speaking.

- The mute dies and the speaking dies.
- Therefore, an animal dies.

### 1.3.2 Inductive Thinking

This type of thinking is based on moving from the specific to the general or from particulars and details to universals and generalities, and then reaching a conclusion or generalization through specific observations or separate facts. This method is opposite to deductive thinking (Al-Hamdani, 2006, p. 313), An example of the induction process is a researcher studying the relationship between the judiciary and the executive branch, then the relationship between the judiciary and the legislative branch, and then the relationship between the legislative branch and the executive branch. Through all of this, we arrive at establishing the principle of the separation of powers as a necessary principle for the system of governance in a state. In this example, we have moved from studying the particulars represented by the different branches of government to studying the universals represented by the principle of the separation of powers. Thus, we have used inductive thinking in this study (Abdelkader, 2009-2010, p. 66).

In any case, induction relies on measurement because verifying the validity of a general law requires applying it to new specific cases we have not examined before, and this is measurement (Kamel Al-Damirdash & Sarhan Mounir, 1963, p. 12).

### 1.4 Characteristics of Scientific Thinking

Scientific thinking did not gain its distinctive features, which allowed it to achieve its remarkable theoretical and practical results, except after a long evolution and overcoming numerous obstacles. Throughout this evolution, people thought in various ways, believing they were all auspicious during their long journey. Ultimately, only those features that proved to enhance knowledge building and increase humans' understanding of themselves and the surrounding world endured (Marah, p. 57).

Therefore, this requirement will highlight the various distinctive features of scientific thinking, such as accumulation and organization, comprehensiveness, certainty, and the search for causes, and other characteristics that can be adopted as criteria to determine the scientific nature of any type of thinking that humans engage in, such as objectivity, precision, and abstraction.

### 1.5 Accumulation and Organization

In this context, we will address the feature of accumulation and the characteristic of organization.

#### 1.5.1 Accumulation

It is acknowledged that science is cumulative knowledge (Zakaria, 2004, p. 15), and this term describes how science develops and advances. Scientific knowledge is akin to a building constructed floor by floor, with a key difference being that the inhabitants of this building continuously move to the upper floor. As they build a new floor, they move to it, leaving the lower floors as mere foundations for the structure (Melhem, 1993, p. 60ff). This cumulative nature is not found in all types of intellectual activities but is limited to some, while others evolve horizontally. For example,



philosophical knowledge did not develop cumulatively, as new philosophical schools did not emerge where old ones ceased to exist. The older schools are just as important as the newer ones.

In contrast, scientific thinking differs entirely because science builds slowly and gradually, with each scientific discovery starting where the previous one ended. Therefore, the accumulation of scientific facts either brings about a fundamental alternative that cancels the old or adds to and modifies it, enriching it vertically (Al-Jamal, 1997, p. 18).

### 1.5.2 Organization

Organization is one of the most critical features of scientific thinking, where ideas are not left free but are arranged in a specific, conscious manner, with deliberate effort to achieve the best possible planning for the thinking process.

Achieving this organization requires overcoming many common daily habits and getting used to subjecting thinking to conscious will, focusing the mind on the researched topic. All these are matters that need special training and are refined through continuous practice (Melhem, 1993, pp. 68-69). The method to achieve organization involves following a scientific approach that begins with observation, then experimentation, followed by theory, intellectual deduction, and experimentation again. Thus, a scientist must follow a systematic method in scientific research from beginning to end; otherwise, their research would not be labeled scientific (Zakaria, 2004, p. 30).

### 1.6 Comprehensiveness, Certainty, and the Search for Causes

In this context, we will address the characteristic of comprehensiveness and certainty and then the feature of searching for causes.

#### 1.6.1 Comprehensiveness and Certainty

Scientific knowledge is known to be comprehensive (Melhem, 1993, p. 73), meaning it applies to all similar phenomena that science investigates and does not concern itself with phenomena in their individual form (Mohamed, 2013, p. 36). Through science, individual experiences transform into general propositions or universal laws. Comprehensiveness means that scientific truth is universal for numerous individuals or phenomena (Al-Jamal, 1997, pp. 21-22).

Because scientific truth is transferable to all who have the mental capacity to understand and be convinced by it, it becomes, once it appears, the property of everyone. This imparts the characteristic of certainty to scientific truth (Zakaria, 2004, pp. 38-39).

Certainty means that scientific thinking is based on a sufficient set of objective and convincing evidence that reaches trust and certainty, although it is not absolute certainty but relative, as science is against constancy, and the only constant truth is that all truths change (Mohamed, 2013, p. 36).

#### 1.6.2 The Search for Causes

Every phenomenon has a cause in the sciences, and when certain causes are present in certain conditions, they lead to specific events. Causality involves uncovering consistent and stable relationships between phenomena, explaining them, controlling variables, and interpreting the results derived from them. It also involves identifying similarities between different phenomena. Sciences have evolved, and their evaluation is now based on their functionality or social purpose, leading to the assessment of relationships, whether causal or functional, between some characteristics or phenomena as existing relationships. This forms the scope of scientific knowledge in any scientific field, and based on this, the accuracy of sciences varies. (Marah, pp. 58-59), and knowing the causes enables better control and leads to more effective results than those obtained through experience and practice (Al-Jamal, 1997, p. 20).

### 1.7 Objectivity, Precision, and Abstraction

In this section, we will clarify the characteristic of objectivity and then the feature of precision and abstraction.

#### 1.7.1 Objectivity

Objectivity has two meanings: the first is avoiding personal biases, inclinations, and subjective purposes when judging situations, and the second is involving more than one person in perceiving or



recording the characteristics of a phenomenon to approximately the same degree (Mohamed, 2013, p. 35). Objectivity requires studying what exists without being influenced by subjective factors, excluding preconceived opinions unless their value and importance are confirmed.

### 1.7.2 Precision and Abstraction

Scientific thinking involves precision and abstraction. A scientific researcher seeks to define their problem precisely, specify their procedures accurately, use mathematical language based on exact measurement, and speak in abstract terms. Abstraction is the researcher's tool for understanding the laws of reality (Mohamed, 2013, p. 36). It is unacceptable in science to leave phrases undefined or use ambiguous and unclear propositions (Al-Jamal, 1997, p. 21).

## 2. Obstacles to Scientific Thinking

Scientific thinking may face obstacles that hinder achieving its intended goal. These obstacles, known as obstacles to scientific thinking (Al-Jamal, 1997, p. 22), A person may be influenced by their cognitive background, which dominates their thoughts and emotions, directing their thinking in the wrong direction. These are known as cognitive obstacles, or errors in scientific thinking may arise due to psychological influences or the society in which one lives.

### 2.1 Cognitive Obstacles

Cognitive obstacles include myth or superstition and the denial of reason's capability, and the loss of a scientific foundation and blind imitation.

#### 2.1.1 Myth or Superstition and the Denial of Reason's Capability

We will address myth or superstition and then the denial of reason's capability.

##### A. Myth or Superstition

There is often confusion between myth and superstition; myths appeared in a stage before science was known, while superstition exists in the scientific stage, denying and rejecting scientific methodology. This means that despite its emergence and development, science has not entirely freed human thought (Melhem, 1993, pp. 82-83).

In modern times, superstitions have taken cover in the realm of science, although science is innocent of them. Superstitious thinking has held a significant place in explaining phenomena, with myths providing a general explanation for a set of phenomena (Idris, 2008, p. 19). Both scientific thinking and superstition seek to explain surrounding phenomena to control and regulate them to meet needs, ward off dangers, and alleviate anxieties (Idris, 2008, p. 21).

Superstitious thinking distances individuals from logical thinking, sound reasoning, accurate judgments, and reliance on objective facts and established realities, thereby hindering scientific and technological progress (Eissawy, 1982-1983, p. 7).

##### a. Denial of Reason's Capability

In some fields such as art and poetry, humans appeal to forces other than reason, which they may call imagination or intuition. They believe these guide them in these domains. Some thinkers deny the mind's ability in this regard, considering it an obstacle to scientific thinking. There are those who always imagine that the optimal method of human knowledge is not based on evidence or rational arguments, but on direct intuition that leads us to the essence of the subject we seek to understand. According to those who deny its ability, the mind remains incapable of uncovering many of the universe's mysteries, revealing its limitations. Therefore, reliance on other forces is deemed necessary. (Zakaria, 2004, pp. 70-72).

#### 2.1.2: Loss of Scientific Foundation and Blind Imitation

This branch addresses two obstacles: the loss of a scientific foundation and blind imitation.

##### A. Loss of Scientific Foundation



We must question whether the loss of a scientific foundation is a cause for the cessation of scientific thinking or a result of its absence?

The reality is that there are impoverished, underdeveloped societies that have never been able to prepare the necessary national frameworks, while other societies have the capability, especially the financial means, to prepare all the required frameworks. It should be noted that underdevelopment is not merely material since some societies are abundantly rich in resources.

Underdevelopment is purely human, concerning people alone. Progress is based solely on science and through specialists who, driven by various circumstances, become alienated from their societies and sacrifice them for other advanced societies that offer them better living conditions. Consequently, these educated individuals contribute to preventing the establishment of a scientific foundation or even help destroy any emerging foundation, thereby affecting scientific thinking (Melhem, 1993, pp. 100-102).

### a. Blind Imitation

Blind imitation is one of the manifestations of intellectual stagnation. This situation arises when society imposes its opinion on its members to follow a specific idea without discussion or criticism, prohibiting them from crossing the red lines it has set. Here lies the significant disaster: this behavior destroys creativity and development, obliterating the faculty of thinking and innovation. The worst aspect is that it establishes a weak ideological foundation that quickly collapses when confronted with other ideas in the arena of ideological conflict. Consequently, groups that impose blind imitation on their members quickly perish and disappear. Some of these groups forbid their members from engaging in ideological or intellectual discussions. The truth is that robust ideological strength and solid thinking stem from the ability to critique, analyze, and understand facts with their causes. While it is true that one should not reject renewal and openness to others' experiences and interaction with them, we must be cautious of blind imitation, which erodes our national identity (Benafi, 2013).

Human beings are inherently inclined to question and seek verification, but imitation extinguishes the eagerness for inquiry and suppresses the natural desire for knowledge, deluding people into believing they possess clear truth not through research and exploration but through passive absorption without any caution or scrutiny (Benafi, 2013).

## 2.2 Psychological and Social Obstacles

In this requirement, we address psychological obstacles and social obstacles.

### 2.2.1 Psychological Obstacles

Psychological obstacles can hinder scientific thinking. Among them are submission to authority and fanaticism.

#### A. Submission to Authority

Submission to authority is a convenient way to solve problems, but it reflects a lack of creativity and a creative spirit.

A notable example of intellectual and scientific authority in cultural history is the figure of Aristotle. This Greek philosopher remained the primary source of knowledge in various fields throughout the European Middle Ages, with many of his propositions accepted without question. The noteworthy aspect of submission to authority is that it often takes the form of glorification or sanctification, which serves to inhibit others' thinking and paralyze their creative abilities (Zakaria, 2004, p. 62).

Galileo fought a fierce battle against Aristotle's authority, critically examining his ideas. Galileo's scientific thinking was a significant factor in dismantling Aristotle's authority at the dawn of the modern era. Hence, submission to authority is an obstacle to scientific thinking. Key supports for this obstacle include (Zakaria, 2004, pp. 68-70):

- **Popularity and Fame** Opinion gains authority when it is widespread among people, just as it gains authority when it comes from a person renowned among them for expertise and knowledge in their field.
- **Desire or Wishful Thinking** People tend to believe what they desire or hope for, and conversely, they fiercely oppose what contradicts their wishes.

#### a. Fanaticism

Fanaticism is a false belief that one monopolizes truth or virtue, considering others devoid of it, always assuming they are wrong (Mohamed, 2013, pp. 54-55).

Thus, fanaticism is a severe obstacle to scientific thinking, narrowing the scope of thought within a specific opinion and making the truth subjective, belonging to an individual rather than others. Each person is convinced of their idea without considering its objectivity (Mohamed, 2013, p. 57).

#### 2.2.2 Social Obstacles

Social obstacles include media misinformation and stagnation and living in the past.

##### A. Media Misinformation

In the past, media relied on direct communication between the sender and the receiver, resulting in intellectual and cultural renaissance as seen among the Arabs before Islam and the Greeks. Due to the impact of media on people's minds, scientific studies have increased to explore the most effective means of media influence, including human sciences. Despite its scientific appearance, this has been exploited to find the best ways to objectify humans (Murai, 2024).

Modern media propaganda works hard to undermine the spirit of critique and promote a spirit of obedience. Current media tends to stray from the objectivity and integrity necessary for all scientific thinking (Murai, 2024).

What wide-reaching media presents does not serve the cause of scientific thinking or help spread its value among the broad masses influenced by these media. The experiment of shaping people's minds into uniform molds serving a specific regime's purposes began during the Nazi era in Germany, significantly paralyzing the ability for independent thinking (Zakaria, 2004, p. 83).

This creates an obstacle that conceals scientific facts, preventing any scientific renaissance from enlightening thought (Marah, pp. 60-61).

The dangers of media on thinking include (Mohamed, 2013, p. 59):

- Being directed to serve specific products and individuals.
- Being subject to authority and biased towards its ideology.
- Having a significant influence on the general public's minds, leading them and directing their thinking in a specific direction.

All this negatively impacts scientific thinking, which is characterized by comprehensiveness, abstraction, and impartiality, looking objectively at different phenomena (Mohamed, 2013, p. 59).

Hence, misleading media is a significant obstacle to scientific thinking in our contemporary world, as scientific thinking only recognizes one truth, which does not change interpretation based on interests (Zakaria, 2004, p. 87).

This obstacle poses a serious danger to our minds and our ability for objective thinking in the Arab world. Media not only misleads but also encourages and nurtures triviality (Zakaria, 2004, p. 90).

#### a. Stagnation and Living in the Past

Relying on the past involves adhering to its scientific, social, economic, or political principles, opinions, customs, traditions, and principles that ancient civilizations were built upon. The opinions inherited from ancestors retain their influence and power (Mohamed, 2013, p. 94), often surpassing contemporary opinions, believed to hold value and wisdom. This view involves an imaginary glorification of the past. However, the older generation lived in a time when humanity had not yet





acquired sufficient experiences, making their experience limited. In contrast, the modern generation has gained the experience of the ancients and added its own, making it more qualified in terms of experience and knowledge. Thus, the age of an opinion does not indicate its correctness (Zakaria, 2004, pp. 63-64).

Clinging to the past is a direct path to stagnation and rigidity, reinforcing backwardness with all its causes and characteristics. Why not consider this path a legitimate means to cover a present lacking in everything? What further stifles thinking are those who follow parasitic ideas without prior knowledge or understanding (Mohamed, 2013, pp. 95-96).

## CONCLUSION

From the above discussion, we conclude that scientific thinking is a complex and intricate process involving various mental abilities and skills aimed at reaching new results. There are two types of scientific thinking: deductive thinking, which enables a person to arrive at truths deductively based on correct and accepted principles, laws, and rules, studying a phenomenon holistically down to its details; and inductive thinking, which moves from the part to the whole and from the specific to the general.

Scientific thinking is distinguished by several characteristics that set it apart from other forms of thinking. One of these characteristics is accumulation, The second characteristic is organization, which involves structuring scientific knowledge in a specific, organized manner to keep it away from spontaneity and randomness. The third characteristic is objectivity, meaning the avoidance of subjective biases when judging a particular situation and excluding preconceived opinions unless their value is confirmed. The fourth characteristic is the search for causes, the fifth characteristic is comprehensiveness and certainty, meaning that scientific knowledge is comprehensive and applies to all parts of the phenomenon studied by science, distinguishing scientific thinking from other artistic and poetic works. The final characteristic is precision and abstraction, where scientific thinking is precise in its handling of phenomena and avoids ambiguity.

Human beings have faced numerous obstacles or hindrances before discovering scientific thinking methods. These obstacles include cognitive hindrances such as myths or superstitions, denial of reason's capability, loss of a scientific foundation, and blind imitation; psychological hindrances such as submission to authority and fanaticism; and social hindrances like media misinformation and stagnation and living in the past.

In this regard, we can propose some recommendations:

- The remedy for these obstacles lies in Islamic education derived from the pure revelation that commanded and encouraged knowledge in the first verse revealed to our Prophet Muhammad (peace be upon him).
- There is a necessity to conduct comprehensive and in-depth studies and scientific research on each of the obstacles to scientific thinking individually.
- Educating generations about the importance of scientific thinking as a fundamental methodological element in all fields of life and the dangers these obstacles pose to building sound scientific thinking.

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