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The Reality of Teaching Practices Consistent with the Principles of Brain-Based Learning among Middle School Science Teachers from the point of view of Educational Supervisors in the City of Tabuk

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ABSTRACT

The objective of the current research is to determine the reality of teaching practices consistent with the principles of brain-based learning of middle-stage science teachers from the point of view of the 12 educational supervisors in Tabuk, who represented and appointed the research community, using the survey descriptive curriculum. In order to achieve the research objectives, the researcher formulated the main question of the research as follows: What is the reality of teaching practices consistent with the principles of brain-based learning of female science teachers for the middle stage from the point of view of female pedagogical supervisors, and the main question is the sub-questions that determine the reality of teaching practices in four axes, including: lesson planning, lesson implementation, evaluation and educational environment, To answer research questions, the researcher applied research tools that represented a measure of teaching practices consistent with the principles of brain-based learning. The researcher used appropriate statistical methods to extract the results, and the results of the research resulted in, That the response of research personnel came at a level consistent with the realities of teaching practices consistent with the principles of brain-based learning of science teachers for the middle stage from the point of view of educational supervisors in the course planning axis with a computational average (2.63); The results showed that the research response was such that the reality of teaching practices consistent with the principles of brain-based learning in science teachers for the middle stage was accepted from the point of view of educational supervisors in the course's implementation axis with an average arithmetic (2.66). and that research personnel agree favourably with the realities of teaching practices consistent with the principles of brain-based learning of middle-level science teachers from the point of view of educational supervisors in the axis of evaluation methods with an average arithmetic (2.39), The response of research personnel was consistent with the reality of teaching practices consistent with the principles of brain-based learning of middle-level science teachers from the educational supervisors' point of view of the educational environment on average (2.47).

Keywords: Teaching Practices, Brain-Based Learning, Middle School Science Teachers, Educational Supervisors, City of Tabuk**.**

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Introduction:

The teacher is the cornerstone of any process of development or improvement in the educational fields, given the essential and important role they play in this process. The success of any educational process largely depends on the teacher, which has led to vigorous efforts to train teachers in a way that contributes to delivering knowledge to learners at the highest possible level of quality (Mahmoud, 2019). A teacher needs sufficient knowledge of the human brain, its components, and its mechanisms of operation, as well as neuroscience, to perform their role appropriately. This knowledge informs the teacher about the appropriate strategies that, when relied upon, enhance student learning, help in choosing good classroom practices, and identify learning problems and their prominent solutions. Educators benefit from neuroscience and understanding the human brain in recognizing the mechanisms and ways the brain works during learning, as well as determining the appropriate educational environment for this process. Additionally, it contributes to preparing teachers well-versed in neuroscience as a first step towards achieving general and specific educational goals that align with development plans and overcoming learning obstacles and challenges (Mahmoud, 2019).

Numerous studies and research have revealed the role of educational supervision, which is no less important than the role of the teacher. Educational supervision forms a field of education, and its various forms contribute to the advancement of the educational process and the teacher's performance level. Despite the various names of educational supervision, such as educational guidance and educational inspection, it no longer confines itself to its old conceptual core. Previously, it was tasked with developing the teacher's methods within the classroom. However, educational supervision, in its new form, has broader and more comprehensive tasks. Modern educational supervision aims to develop the educational situation in all its aspects and elements. This comprehensive concept is achieved through various tasks that educational supervision seeks to achieve its goals and attain its objectives (Al-Qasim, 2010).

Science curricula generally aim to equip students with various skills, especially scientific thinking skills, as they are linked to students' experiences and lives and contribute to raising students' scientific thinking levels, particularly in the context of socio-scientific issues (SSI). These curricula aim to develop mental skills and provide them with scientific concepts and facts discovered by the human mind. These mental processes are carried out through various scientific methods such as observation, inquiry, and research, which represent the essence of scientific thinking (Al-Jorani, 2008). The science process approach in science curricula is based on several scientific axioms or principles, such as considering science an investigative project. Therefore, the science curriculum should be taught in all its branches following consistent and correctly organized steps. Science can be seen as more than just an accumulation of facts and concepts; it is an organized and directed methodology that involves logically posing questions and then diligently trying to find answers to them. From this perspective, teaching science is seen as an organized attempt to teach students this set of scientific facts and generalizations using the methodology of scientists' inquiries.

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The goal of science curricula and teaching is to impart or acquire students with scientific methods. Hence, the science teacher becomes a crucial pillar in providing educational opportunities that help the student learn how to acquire knowledge independently by planning and designing scientific and practical activities and experiences that engage all students in work and learning. This leads to raising the level of positive attitudes towards learning and school, moving away from a pattern focused on memorizing information without employing it effectively in practical and real life (Al-Khalidi, 2019).

Science courses at the middle school level are closely and strongly linked, with the scientific content of the science curriculum connected to human experience for middle school students. This is due to the distinctive features of this educational stage, including the emergence of initial cognitive independence, accelerated physical, intellectual, and mental growth, and increased self-reliance in personal decision-making and identity formation. According to the principles of brain-based learning, Engle and Gathercole (2008) indicate that brain-based learning occurs through the following five stages: the preparation stage, followed by the acquisition stage, then the preference stage, the memory formation stage, and finally, the functional integration stage. It can be said that brain-based learning is an educational model that enhances students' productivity, reduces their frustration, and provides learners with the opportunity to achieve better learning (Qatami & Al-Masha'leh, 2007). Brain-based learning can be described as learning that occurs when the mind is ready, present, alert, and prepared to learn or receive learning (Al-Khawalda, 2016).

Teaching practices, including planning, implementation, and evaluation, are fundamental pillars for the success of the educational process. Knowledge, experiences, and skills are transferred and exchanged between the teacher and the learner through teaching practices, which significantly contribute to educational reform and the enhancement of its various outcomes, a goal pursued by all countries (Sobhi, 2022). Mahmoud (2019) indicated a clear connection between brain-based learning and classroom practices. This connection manifests as a complex relationship, where one of the crucial strengths for the success of the teaching and learning process is the teacher's understanding of the cognitive and psychological development of learners. This includes discovering their different learning styles, their mental strength and alertness centers and times, which contributes to good organization for effective learning and teaching. Consequently, teachers must focus on nurturing minds and fostering critical thinking, training learners to take significant responsibility for all aspects related to their learning, such as contributing to setting learning objectives, formulating them, organizing and directing learning processes, planning and directing their mental processes towards achieving their goals, being aware of appropriate strategies and methods to achieve them, managing the time and effort required to complete the task, and making greater efforts to organize the learning environment and interact with learning resources and others.

In light of the above, there has been an increased need to employ various modern educational methods and strategies to align with the educational trend of making students more active in seeking information and learning thinking skills, linking

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students' educational needs with teachers' professional capabilities to keep pace with rapid changes. This is achieved by searching for strategies that stimulate thinking and improve academic achievement. Brain-based learning is one of the promising modern methods that place students at the center of the educational process.

Based on the Above:

In light of the numerous challenges facing the educational field, which necessitate keeping pace with scientific and technological advancements by nurturing generations of learners according to scientific principles and skills that help develop their scientific thinking and improve their academic achievement, there is an urgent need to apply active and constructive learning strategies. These strategies can overcome the difficulties and problems faced by the learning system, addressing low achievement and scientific thinking in scientific subjects. In this context, Rashdan (2019) noted that teachers can teach the curriculum in light of brain-based learning by using different strategies according to the characteristics of the brain's hemispheres. Various strategies are used to activate both sides of the brain.

Based on the above and in line with Saudi Arabia's Vision 2030, which embodies a comprehensive and general reform and development plan aiming to keep pace with current advancements and enter the future robustly, a significant aspect of the plan focuses on education and its contributions to achieving the vision's goals, emphasizing all dimensions of the educational system.

Problem Statement and Research Questions:

Numerous studies and research have indicated that student failure is not solely due to differences in their levels and educational abilities but also extends to the variation in teaching methods used with them in the classroom. Amid global attention and reform movements in science curricula and teaching, and in line with global developments across various fields calling for a creative, thoughtful, and positive generation, Saudi Arabia has focused on developing its curricula and revising its teaching strategies. This is evident through the formulation and adoption of the Mathematics and Science Development Project by the Ministry of Education, including the development of biology curricula. These curricula were introduced with a philosophy and methodology that encourages thinking, research, and inquiry. These modern trends and aspirations for curricula and educational goals stem from Saudi Arabia's Vision 2030. Achieving these goals cannot be accomplished through traditional and didactic teaching methods; effective strategies must be applied to help students develop their scientific skills.

Therefore, this research aims to explore the reality of teaching practices consistent with brain-based learning principles among middle school science teachers from the perspective of educational supervisors.

Numerous studies have highlighted the effectiveness of employing brain-based learning principles, whether in curriculum development or in improving teaching methods. For instance, Al-Ghamdi's (2019) study recommended benefiting from the proposed instructional design based on brain-based learning principles to improve students' performance in achievement tests. Similarly, Afia's (2020) study

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recommended encouraging researchers to conduct studies and write papers on brain-based learning topics and incorporating activities and strategies that employ brain-based learning principles in curricula.

From the researcher's experience as a science teacher, it was observed that there is a scarcity in the use of effective teaching methods for the developed science curricula, which were prepared to contribute to the development of students' scientific and intellectual skills. However, many current teaching practices among science teachers indicate that teaching often revolves around lower levels of thinking (Afia, 2011). Therefore, it is necessary to seek effective methods that contribute to developing higher-order thinking skills and enhance students' learning skills.

Based on the above, the problem of this research will focus on understanding the reality of teaching practices consistent with brain-based learning principles among middle school science teachers from the perspective of educational supervisors in the city of Tabuk.

In light of the issues discussed in the research problem, the main research question is as follows: What is the reality of teaching practices consistent with brain-based learning principles among middle school science teachers from the perspective of educational supervisors?

The main research question branches out into the following sub-questions:

- What is the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in lesson planning?
- What is the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in lesson implementation?
- What is the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in assessment methods?
- What is the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in the learning environment?

Research Objectives: The objectives of this research are as follows:

- To identify the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in lesson planning.
- To identify the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in lesson implementation.
- To identify the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in assessment methods.
- To identify the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors, in the learning environment.

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Research Boundaries:

Objective Boundaries: The objective boundaries of this research revolve around teaching practices consistent with brain-based learning principles.

Temporal Boundaries: This research was conducted during the first semester of the academic year (1444 AH).

Spatial Boundaries: This research was conducted on science supervisors at the supervision office in Tabuk city.

Research Terminologies:

Brain-Based Learning: The researcher operationally defines it as a set of scientifically supported principles that organize learning in the unit of bacteria and viruses in the biology curriculum for the first secondary grade according to the characteristics and nature of the brain. Its purpose is to equip first-grade female students with scientific thinking skills and to assess its impact on improving their academic achievement.

Teaching Practices: The researcher operationally defines it as verbal and practical procedures determined by the teacher to be performed inside the classroom to deliver scientific material. These procedures include lesson planning, lesson implementation, determining appropriate assessment methods, and creating the learning environment in line with brain-based learning principles.

Educational Supervision: The researcher operationally defines it as a set of scientific, studied, and organized procedures carried out by educational supervisors to evaluate and improve the quality of the educational process. These procedures include school visits, continuous guidance, and decisions that may help improve the performance of teachers, contributing to the improvement and progress of the teaching and learning process.

Second Chapter: Conceptual Framework and Previous Studies:

First Axis: Brain-Based Learning

1.1. Brain Components and Functions

Neuroscientists, using various modern and multiple techniques in recent years, have been able to identify the basic structure of the brain. It consists of the brain cells, the back of the brain, or what is called the hindbrain, the middle of the brain, or the midbrain, and the front of the brain, or the forebrain. This part contains the cerebellum and the brain stem. It has been found through reviewing many studies and research that the brain is a pinkish-gray gelatinous ball. Its surface is characterized by many protrusions and grooves from the outside. It is surrounded by three membranes that envelop and protect it. It is located within the cranial cavity. Its weight is about 2% of the adult body weight. The brain consists of two types of cells, neurons, and glial cells. Glial cells are responsible for transmitting nerve messages, providing myelin, regulating the immune system, and digesting damaged nerve cells, while neurons transmit stimuli from reception centers in the body to the nerve center, linking sensory nerves, motor nerves, and muscles. The number of neurons is about a hundred billion cells, each of which is connected to each other to form a network responsible for controlling mental functions. The brain controls all internal processes and emotions in the human body, receiving and interpreting countless signals from different parts of the body or from the external environment.

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1.2. Brain Function Mechanism:

The last decade of the twentieth century witnessed numerous studies on the structure and function of the brain, focusing on the connection between the brain and the body, psychological and emotional reactions, and the social environment due to their impact on brain function (Al Jurani, 2008). To clarify the connection between the brain and these aspects:

Firstly: The Relationship between the Brain and the Body:

The brain relies on nerve and mental inputs from the body's reception organs to issue commands. It has been mentioned that the mind and body represent one word, and intelligence cannot be said to reside solely in the brain but in cells distributed throughout the body. Thus, the mind is considered a natural extension of the entire body. For example, the immune system has memory and learning capabilities similar to the nervous system. It has also been noted that neuroscientists have discovered anatomical sites with a high concentration of most peptide receptors, such as the posterior part of the spinal cord, which is a neural junction point where all information, whether sensory or bodily, is processed (Mohammed, 2015).

Secondly: The Relationship between Emotions and Brain Functions:

There are four basic types of emotions: fear, sadness, anger, and joy. Other emotions result from the integration of these four types. For example, anxiety arises from the integration of fear and sadness. Pert (1977) mentions that scientists have discovered anatomical locations with high concentrations of most peptide receptors, such as the posterior part of the spinal cord, which is a neural junction point where all information, whether sensory or bodily, is processed. Additionally, Al Salati (2002) points to the relationship between music and art in evoking emotions and their impact on learning, clarifying the effect of emotions on brain learning. It is found that music strengthens learning by stimulating attention neurotransmitters and neural pathways in the brain, contributing to the speed, sequence, and strength of connections. Similarly, Al Shammari (2018) suggests that creativity requires a state called "flow," where a person merges a set of enjoyable activities with a specific goal, which should be experienced daily by students in their subjects and by university professors in their research to ensure progress.

Thirdly: The Relationship between the Brain and the Social Environment:

Humans can develop their mental capacities at all stages of life. Mental development is not tied to a specific age, meaning that humans have the potential to increase their intelligence without limits or restrictions by providing and preparing the appropriate environment. Neuroscientists found that university graduates have a 40% increase in neural connections compared to those who dropped out of school. They also discovered that it is possible to regenerate brain nerve cells due to environmental enrichment, especially in the part responsible for memory formation. Despite losing brain cells every day, new cells can grow in a rich and stimulating environment. Research outcomes indicate the following:

- Environmental enrichment has deep effects at all ages.
- Human brains, with environmental enrichment, can produce new nerve cells to replace damaged ones.

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- Studies have shown changes in nerves every 48 hours after exposure to environmental stimuli.
- Complex educational tasks are better than simple or modest ones, and more exercise is better than lethargy and inactivity, with interaction being better than stillness and isolation (Jensen, 2000). Based on the above, understanding the mechanism of brain function correctly and deeply contributes to assisting individuals involved in the educational process, whether curriculum designers or teachers, in understanding learning correctly, planning the educational process well, and maximizing the use of brain capabilities. It also helps them enhance brain hemispheres effectively, resulting in positive outcomes that serve the educational process.

1.3. The Concept of Brain-Based Learning:

According to Afana and Aljishi (2008), brain-based learning is one of the strategies based on brain research with two sides. It relies on five main consecutive steps: (preparing for learning, organized integration, quiet alertness, active processing, and expanding brain capacity). According to Spears & Wilson (2012), brain-based learning constitutes a comprehensive entry into learning based on neuroscience research and brain preparation for learning naturally. Brain-based learning provides a framework for education and learning, helping to interpret repetitive learning behaviors and emphasizing to teachers teaching students real-life experiences.

Brain-based learning is defined as learning that activates and invests the brain's potential energy by providing educational experiences in a training environment with specific characteristics for teachers. It is accomplished by employing teaching strategies based on brain learning principles, taking into account the availability of conditions and circumstances conducive to growth.

Thus, the researcher defines brain-based learning as a combination of steps, procedures, and practices that can stimulate students' minds and contribute to maximizing their mental abilities by linking the learning process to the brain's natural characteristics while ensuring the provision of a suitable educational environment with specific specifications, managed by experienced teachers knowledgeable about brain-based learning principles.

1.4. Factors Influencing Brain-Based Learning and Their Educational Applications:

There are several factors influencing brain-based learning as outlined by Azaldin (2015) and in the research by Afana and Aljishi (2009), namely:

- Biological Factor: Aimed at understanding the nature, structure, and functions of the brain, it is necessary to provide a classroom environment that considers the brain's structure and mechanisms.
- Genetic Factor: Genetics and genes play a significant role in learning, as genes and hereditary traits affect the brain's capacity.
- Emotional Factor: This factor is linked to experiences with sharp emotions that impact brain learning, affecting focus, attention, memory, and thinking.
- Sensory-Motor Factor: This factor encompasses all information received through the senses, leading to the brain receiving accurate information.

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• Nutritional Factor: Like any other organ in the body, the brain needs proper nutritional supply, especially vitamins.
• Environmental Factor: This factor explains how external conditions and experiences affect learning. The environmental factor affects all other factors influencing learning, along with the sensory-motor factor, contributing to the learner's maximum learning.

From the above, the researcher observes that the success of brain-based learning depends on several necessary and diverse factors that directly and indirectly affect the success of the educational process according to this educational model. These influencing factors range from biological and genetic factors to emotional, sensory-motor, nutritional, and environmental factors. Additionally, the researcher also concludes that the elements, components, and boundaries of these factors are intertwined and interconnected, with each factor interacting with and based on the others. Here lies the teacher's ability to influence and be influenced by these factors to achieve the best educational level for learners.

Axis Two: Teaching Practices and Their Relationship to Brain-Based Learning Principles

2.1. Concept of Teaching Practices

Educational literature has addressed various concepts related to teaching practices through numerous studies and research, aiming to identify and establish a comprehensive and general understanding of this concept. Teaching practices have been defined in multiple ways. Hindi and Al-Tamimi (2013) defined teaching practices as a set of actions and activities carried out by teachers inside the classroom, including setting objectives, planning, types of questions and their presentation methods, assessment, teaching methods, accompanying activities, classroom management in dealing with students, monitoring, encouraging, and supervising their activities.

Mahmoud (2019) defined them as the actions and procedures employed by the teacher to achieve educational goals through a safe classroom environment, with a focus on engaging students' emotions, attracting their attention, and stimulating their brains. Al-Rasheed (2015) defined teaching practices as the scientific procedures or actual behavior performed by the teacher according to the different stages of the lesson plan, aiming to achieve the outlined objectives efficiently, thereby achieving a better level for the student.

Additionally, Sbehi and Al-Quthami (2022) described teaching practices as a set of steps and procedures undertaken by the teacher, including lesson planning, execution, determining appropriate activities, and assessment, with the aim of achieving the desired objectives. The researcher views teaching practices as verbal and practical procedures defined by the teacher to deliver scientific material within the classroom. These procedures include lesson planning, lesson execution, determining appropriate assessment methods, and creating a learning environment that aligns with brain-based learning principles.

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2.2. Teaching Practices and Science Teaching

Sbehi and Al-Quthami (2022) pointed out that the nature of science teaching differs from that of other subjects. Science heavily relies on engaging all learners in scientific activities, in addition to their participation in practicing various scientific processes. Several factors necessitate science teachers to employ diverse teaching practices, including:

- Science is based on two fundamental aspects: understanding concepts and understanding processes. It is not sufficient for learners to acquire concepts and information alone; they must also learn the processes through which these concepts are obtained.
- Science is experimental in nature.
- Science cannot be learned without its technological applications and its relation to the society and environment in which the learner lives.
- The cognitive explosion in science and the shift from teaching isolated scientific facts to teaching scientific concepts containing these facts.
- Science provides a means for learners to explain various phenomena surrounding them.

Science is a scientific subject that is closely related to the human experience of learners, playing a significant role in modern life. In recent years, there has been rapid progress in scientific knowledge, which learners experience in their daily lives and during science lessons. Therefore, it is imperative to strive for progress through focusing on science teaching, which consists of scientific methods aimed at developing concepts and models about the natural world. This creates a precise cognitive fabric of facts and ideas related to that world, adding mental and cognitive skills to students, such as observation accuracy, practicing various thinking skills, and scientific application, contributing to building the necessary scientific methodology for individuals dealing with various scientific fields (Al-Khaldi, 2019).

- **Relationship between Teaching Practices and Brain-Based Learning Principles**

The principles of brain-based learning have impacted many educational fields, highlighting the positive role of the brain in learning and knowledge acquisition. Mahmoud (2019) indicated that the relationship between brain-based learning and classroom practices is strong, deep, and complex. Important strengths for the success of the teaching and learning process include understanding the cognitive and psychological development of learners, discovering their different learning patterns, and determining times of mental alertness. This contributes to effective learning organization, necessitating teachers to focus on nurturing minds, fostering critical thinking, and making learners integral parts of the educational process.

Based on the above, the strong relationship between brain-based learning principles and teaching practices is evident. These practices include procedures and actions undertaken by teachers and learners, whether it involves creating safe, stimulating learning environments that align with brain-based learning principles, utilizing diverse teaching strategies and methods to cater to all types of learners, or employing varied assessment methods.

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Axis Three: Educational Supervision

3.1. Concept of Educational Supervision

Educational supervision is one of the fundamental pillars in any educational system, entrusted with monitoring, diagnosing, and developing educational processes according to the needs of teachers, learners, the educational process itself, and the community. It has received significant attention in educational literature, with various definitions provided. The Educational Supervision Guide (issued in 1419 AH) defined educational supervision as a comprehensive technical, advisory, and leadership process aimed at evaluating and developing the educational process at all its stages. Shahin (2010) defined educational supervision as the process of evaluating and developing the educational process and monitoring its implementation to achieve predetermined educational objectives. Al-Harithi (2012) described it as a deliberate and organized process conducted by experienced and competent educational supervisors, aiming to evaluate, improve, and develop teaching by teachers.

Based on the above, educational supervision is viewed as a scientific, deliberate, and organized process conducted by educational supervisors to evaluate and develop the educational process. This is achieved through school visits, continuous guidance, and decisions that help improve teachers' performance, thereby enhancing the teaching and learning processes.

3.2. Objectives of Educational Supervision

The importance of educational supervision, according to Al-Qasim (2010), Shahin (2010), Al-Harithi (2010), Geeto (2015), and Al-Najjar (2019), includes several points:

- Directly contributes to the development of educational work in schools.
- Provides guidance and advice to school staff to improve performance within and outside the school, and optimize the use of public resources, school facilities, and teaching technologies.
- Enhances principles of cooperation and effective participation in schools and the educational field, benefiting the educational process, learners, and teachers.
- Helps educational administrations achieve their desired objectives.
- Encourages innovation, development, and renewal by solving current problems and fostering competition among educational administrations, teachers, and learners.

3.3. Importance of Educational Supervision

Educational supervision is tasked with a significant mission of developing and improving the educational process, acting as a vital link between all elements of the educational process and outlining its broad lines. Al-Kalbani (2016) attributed the importance of educational supervision to several points, including:

- The presence of untrained veteran teachers in modern teaching methods.
- Limited experience among some novice teachers entering the educational process.
- Insufficient or inadequate professional preparation for some teachers.
- Poor performance among some teachers.
- Developing teacher preparation in light of the modern and rapid changes in the educational process.

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- Assisting in exchanging experiences and experiments among teachers of different experiences and qualifications.

3.1. Methods of Educational Supervision

The Ministry of Education (1427 AH) defined the methods of educational supervision as individual and collective supervisory activities used to evaluate content, performance, facilities, achieve professional growth, and improve teaching and learning. Various research and studies have agreed on several methods of educational supervision, including:

- School visits.
- Classroom observations.
- Individual meetings (supervisory discussions).
- Educational informational and awareness bulletins.
- Exchange visits between teachers.
- Development workshops in educational fields.

Axis Four: The Middle Stage: Its Concept and Characteristics of Its Students

4.1. Concept and Importance of the Middle Stage

The concept of the middle stage varies from one country to another and from one culture to another. Despite differences in nomenclature, the constants remain the same. The middle stage is an age group that starts at thirteen years old, marking the end of compulsory education between the primary and secondary stages. Al-Shuaibat (2015) defined it as the middle stage in the ladder of learning, preceding primary education and followed by secondary education, spanning from the age of twelve to fifteen.

Dealing with the middle stage correctly helps students, their families, and communities achieve essential goals in this stage, including building character, instilling values, developing skills, self-discovery, preparing for future educational stages, and preparing for social interaction.

The researcher sees the middle stage as a crucial transition between childhood and youth, the primary gateway to self-independence. Despite differences in nomenclature and curricula, all countries now agree on imparting students with fundamental knowledge and developing various skills, integrating both theoretical and practical aspects. Hence, the importance of this stage lies in preparing students for the future, fostering comprehensive and integrated student development, considering the needs, abilities, characteristics, and requirements of this stage.

4.2. Characteristics of Middle Stage Students

Middle stage students exhibit multiple characteristics, including:

- Physical growth, where height and weight increase, senses become sharper, health improves, students become more concerned about their appearance.
- Motor growth, characterized by increased activity, strength, and most student behaviors becoming realistic and logical.
- Emotional growth, where emotions are strong, and some students may experience depression or introversion due to conflicts between motivations and societal traditions. Also, clear feelings of anger and rebellion against sources of authority in the family, home, and society may be observed.

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The researcher believes that understanding the characteristics of the middle stage helps in developing and enhancing the capabilities and skills of teachers in selecting appropriate teaching methods for this stage, as well as diversifying teaching methods. Additionally, teachers' ability to diversify the use of various assessment tools and methods, tailored to the differences in students' abilities and inclinations, is crucial.

In light of the principles of brain-based learning, the researcher concluded that the brain functions best in a safe, stimulating, harmonious, and coherent learning environment. Since the brain is a unique entity, it is up to the teacher to diversify their strategies and educational experiences provided to students to facilitate effective learning. This contrasts with traditional learning based on memorization and recall, which may only develop one hemisphere of the brain and neglect the other. Additionally, brain-based learning is considered a holistic approach that, through its diverse strategies based on its principles, can accommodate the diversity of students and their abilities and inclinations.

Chapter Three: Research Methodology and Procedures

Research Method: The researcher adopted a descriptive survey methodology for this study, aiming to collect data about a specific phenomenon or topic. Through this information, the researcher intends to determine the strength or weakness of the current situation and the actions taken towards it.

Research Population: The original population for the current research consists of all science supervisors at the Educational Supervision Office in Tabuk, for the academic year (1443-1444 AH), totaling (12) educational supervisors, as obtained by the researcher from the Planning and Information Management Department at the Education Administration in Tabuk.

Research Sample: Due to the small size of the research population, the researcher employed the comprehensive census method on all members of the population. Thus, the research sample consisted of (12) educational supervisors, which is the same as the research population.

Research Tools: The current research utilized a descriptive statistical scale (an estimation scale) for teaching practices consistent with brain-based learning principles. The researcher constructed a scale to measure teaching practices consistent with brain-based learning principles. The scale's validity and reliability were verified through the following steps:

- Reviewing educational literature and research that focused on building and developing performance and evaluation scales.
- Identifying the desired objectives to be achieved from formulating the scale. The scale in this study aims to measure and assess teaching practices consistent with brain-based learning principles based on the previously mentioned axes in the theoretical framework.
- Formulating scale items and distributing them across the specified axes in this research. Five axes were built, each consisting of a set of items representing the application of that axis. The total number of items was (33), distributed as follows:
- Axis One: Planning and Objectives, consisting of (6) items.
- Axis Two: Lesson Execution, consisting of (12) items.

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- Axis Three: Assessment Methods, consisting of (6) items.
- Axis Four: Learning Environment, consisting of (9) items.
- Responses were provided for each axis, with three responses: (Agree – Partially Agree – Disagree), according to the degree of agreement of the science supervisors.

Research Implementation Steps and Procedures: After completing the steps of building the research material and tools, and ensuring their validity and reliability, and that they are suitable for application to the research sample, the researcher followed these steps for conducting the research:

- Obtaining a letter from the Education Administration in Tabuk addressed to the head of the science supervisors in the Education Administration in Tabuk.
- Obtaining the number of science supervisors at the Educational Supervision Office in Tabuk.
- Meeting with the head of the science supervisors department, briefing her on the scale, and discussing it.
- Applying the research tools.
- Analyzing the data and information obtained from the research tools statistically.
- Monitoring the research results, interpreting and discussing them, and answering the research questions.
- Providing recommendations and suggestions based on the research results.

Validity of the Research Tool: A. Face Validity of the Research Tool (Expert Validity): After the researcher prepared the questionnaire for measuring teaching practices consistent with brain-based learning principles among middle school teachers in its initial form, she distributed it to some specialists in the research topic to ensure its face validity. The experts provided their opinions, and after modification, deletion, and addition to the tool, the final version of the tool was prepared.

B. Internal Consistency Reliability of the Tool:

To ensure the internal consistency reliability, the researcher calculated the Pearson correlation coefficient between the score of each item in the questionnaire and the total score of the axis to which the item belongs. This was done as follows:

Table No. (7) Pearson Correlation Coefficients for Scale Items:

Correlation coefficient	number	Correlation coefficient	number	Correlation coefficient	number	Correlation coefficient	number
Educational Environment		**Assessment**		Execution		**Planning and Goals**	
**0.919	1	**0.933	1	**0.894	1	**0.894	1
**0.919	2	**0.940	2	**0.906	2	**0.854	2
**0.937	3	**0.946	3	**0.939	3	**0.882	3
**0.943	4	**0.918	4	**0.854	4	**0.893	4
**0.933	5	**0.903	5	**0.907	5	**0.879	5
**0.782	6	**0.871	6	**0.917	6	**0.870	6
**0.685	7			**0.924	7		
**0.874	8			**0.933	8		

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**0.784	9		**0.865	9	
			**0.909	10	
			**0.685	11	
			**0.782	12	

Significant at 0.01 level or less

The table above indicates that all items are statistically significant at the 0.01 level. This suggests high internal consistency coefficients, indicating sufficiently high and reliable validity indices for the research tool.

To assess the reliability of the research tool (survey), Cronbach's alpha coefficient was used. Table (8) illustrates the results of Cronbach's alpha coefficient for measuring the reliability of the research tool.

The axis	Number of Statements	Axis Stability
Planning and Objectives	**6**	**0.590**
Execution	**12**	**0.736**
Assessment	**6**	**0.572**
Educational Environment	**9**	**0.803**
Overall Stability	**33**	**0.904**

The above table shows that the research tool enjoys statistically acceptable stability, with an overall stability coefficient of (0.904). The stability coefficients for the dimensions ranged from (0.572 to 0.803), indicating high stability that can be trusted in the application of the research tool.

Statistical Processing Methods: The researcher used the Statistical Package for the Social Sciences (SPSS) software for data coding, entry, and analysis. To determine the length of the Likert scale used in the research dimensions, the range (3-1=2) was calculated by dividing it by the number of scale cells to obtain the correct cell length (2/3= 0.66). Later, this value was added to the lowest value on the scale (or the starting point, which is 1) to clarify the upper limit of this cell. Thus, the cell lengths became as shown in the following table:

Table (9) Distribution of Means According to the Gradient Used in the Scale

Category	Range of Means	Agreement Level
First	From 1.00 to 1.66	Disagree
Second	From 1.67 to 2.33	Neutral
Third	From 2.34 to 3	Agree

Calculating frequencies and percentages was done to identify the personal and functional characteristics of the research sample and determine their responses to the

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key statements included in the research tool. Subsequently, the following statistical measures were calculated:

- Pearson correlation coefficient to measure construct validity and internal consistency of the scale.
- Cronbach's alpha coefficient to estimate the reliability of the scale.
- Mean and standard deviation: to ascertain the extent of the research participants' responses to the research questions (average of statement means).

Chapter Four: Research Results and Discussion:

This chapter presents the research results and discusses them by presenting the responses of the research sample to the questionnaire statements. This is achieved by answering the research questions through calculating frequencies, percentages, mean scores, standard deviations, and rankings for the research sample's responses to the questionnaire statements. The results are as follows:

Research Question 1: What is the current status of teaching practices consistent with brain-based learning principles among middle school science teachers from the perspective of educational supervisors in the lesson planning axis:

To identify the current status of teaching practices consistent with brain-based learning principles among middle school science teachers from the perspective of educational supervisors in the lesson planning axis, frequencies, percentages, mean scores, standard deviations, and rankings were calculated for the research participants' responses to the lesson planning statements. The results are presented in the following table: Table (10): Research Sample Responses to Dimension One (Lesson Planning) Statements Ranked Descendingly by Agreement Means

Paragraph	The Statements	Standard Deviation	Average	Rank
5	**Diversity in formulating objectives according to the domains of educational objectives and their levels.**	**0.28**	**2.91**	**1**
3	**Planning to connect the scientific material to the student's real-life experiences.**	**0.57**	**2.83**	**2**
6	**Diversifying procedural objectives to accommodate individual differences among students.**	**0.45**	**2.75**	**3**
4	**Planning to add**	**0.49**	**2.66**	**4**

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	educational activities that stimulate and activate the brain.			
1	**Planning to foster positive attitudes towards science learning.**	**0.67**	**2.50**	**5**
2	**• Planning to activate students' participation in voluntary work (community service).**	**0.71**	**2.16**	**6**
	Overall Average	**0.52**	**2.63**	

From the outputs of the previous table, it is evident that the research participants' response showed an agreement degree regarding the consistency of teaching practices with brain-based learning principles among middle school science teachers, as perceived by educational supervisors in the lesson planning axis with an average score of (2.63).

From the above results, it can be observed that there is variability in the research participants' agreement on the lesson planning and objectives aspect, with their agreement averages ranging from (2.16 to 2.91), which fall into the third and fourth categories of the tripartite scale, indicating agreement with the research tool.

This indicates the variability in the agreement of the research participants on the consistency of teaching practices with brain-based learning principles among middle school science teachers, as perceived by educational supervisors in the lesson planning axis, which were ranked in descending order according to the agreement of the research participants as follows:

- Statement 5 ranked first in terms of agreement with the research participants with an agreement degree and an average of (2.91).
- Statement 5 ranked second in terms of agreement with the research participants indicating agreement with an average of (2.83).
- Statement 6 ranked third in terms of agreement with the research participants indicating agreement with an average of (2.75).
- Statement 1 ranked second to last in terms of agreement with the research participants indicating partial agreement with an average of (2.50).
- Statement 2 ranked last in terms of agreement with the research participants indicating partial agreement with an average of (2.16).

The second question: The reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors in the lesson

implementation axis: To identify the reality of teaching practices consistent with brain-based learning principles among middle school science teachers, as perceived by educational supervisors in the lesson implementation axis, frequencies,

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percentages, arithmetic means, standard deviations, and ranks were calculated for the study participants' responses to statements regarding the lesson implementation aspect.

The results are as shown in the following table: (Table 11) Responses of the research participants to statements of the second dimension (lesson implementation) ranked in descending order according to agreement averages.

The paragraph	The phrases	"The standard deviation"	"The overall average"	Rank
1	Link the lesson to the students' real-life experiences.	0.35	2.97	**5**
2	Align the new lesson objectives with students' prior knowledge and life experiences.	0.30	2.92	**1**
3	Utilize mind maps and conceptual maps in lesson implementation.	0.38	2.83	**2**
4	Activate cooperative groups among students.	0.39	2.83	**9**
5	Provide a summary of the key lesson information.	0.40	2.83	**8**
6	Diversify between active learning strategies during lesson implementation.	0.45	2.75	**3**
7	Allow students time for reflection before answering.	0.51	2.58	**11**
8	Incorporate questioning techniques (What if - How does it	0.53	2.58	**10**

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	happen - How do I know) during explanations.			
9	Diversify between learning resources.	0.55	2.58	**4**
10	Stimulate students' brains by adding games, challenges, and various educational activities.	0.66	2.50	**6**
11	Use coefficients in conducting experiments.	0.52	2.41	**7**
12	Enrich students' scientific knowledge with external information.	0.71	2.16	**12**
The overall average	0.48	2.66		

From the above results, it appears that the participants' responses indicate a moderate agreement with the consistency of teaching practices aligned with brain-based learning principles among science teachers at the middle school level from the perspective of educational supervisors in the lesson planning axis, with an average of (2.66). Through the results above, it is evident that there is variability in the participants' agreement on the lesson implementation dimension, with their agreement ranging from (2.97 to 2.16), which falls into the second and third categories of the three-point scale, indicating a level of agreement or neutrality on the research tool. This reveals the variation in the participants' agreement on the lesson implementation dimension, which has been ranked according to the participants' agreement as follows:

- Statement number (5) ranked first in terms of participants' agreement with an average agreement of (2.97).
- Statement number (1) ranked second in terms of participants' agreement with an average agreement of (2.92).
- Statement number (1) ranked third in terms of participants' agreement with an average agreement of (2.83).
- Statement number (6) ranked second to last in terms of participants' agreement with an average agreement of (2.41).

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• Statement number (4) ranked last in terms of participants' agreement with a neutral average of (2.16).

Question three: The reality of teaching practices consistent with brain-based learning principles among science teachers at the middle school level from the perspective of educational supervisors in the assessment methods axis:

The results regarding the degree of the reality of teaching practices consistent with brain-based learning principles among science teachers at the middle school level from the perspective of educational supervisors in the assessment methods axis, and the percentages, averages, standard deviations, and rankings of the study participants' responses to the assessment methods dimension are illustrated in the following table:

Table (12): Participants' responses to the statements of the third dimension (assessment methods) arranged in descending order according to the agreement averages.

Paragraph	Statements	Standard Deviation	The arithmetic mean	Rank
4	Diversity in using pre-assessment, formative, and summative assessments.	0.28	2.91	1
5	Assigning students to write about what they have learned (essays, reports, worksheets).	0.51	2.58	2
3	Assigning students to perform practical tasks that link lesson content to real life.	0.52	2.50	3
2	Using a variety of assessment tools.	0.51	2.41	4
3	Activating self-reflection cards for each student.	0.90	2.08	5
6	Assessing students' attitudes towards learning science.	0.79	1.91	6
	Overall Average	0.58	2.39	

From the above results, it is evident that the research participants agree to a degree of consensus on the reality of teaching practices consistent with the principles of brain-based learning among science teachers at the middle school level from the perspective of educational supervisors in the evaluation methods axis, with an average score of (2.39). The results indicate variations in the agreement of the research participants on the dimension of evaluation methods, where their agreement scores ranged from (2.91 to 1.91), falling within the third and second categories of the tripartite scale, indicating a degree of consensus (agree - agree to some extent) on the research tool.

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This reveals the variation in the agreement of the research participants on the dimension of evaluation methods, which were arranged in descending order according to the agreement of the research participants as follows:

- Statement (1) ranked first in terms of agreement of the research participants with a degree of agreement and an average score of (2.91).
- Statement (5) ranked second in terms of agreement of the research participants with a degree indicating agreement with an average score of (2.58).
- Statement (1) ranked third in terms of agreement of the research participants with a degree of agreement and an average score of (2.50).
- Statement (3) ranked fourth in terms of agreement of the research participants with a degree indicating agreement to some extent with an average score of (2.08).
- Statement (3) ranked last in terms of agreement of the research participants with a degree indicating agreement to some extent with an average score of (1.91).

The fourth question: The reality of teaching practices consistent with the principles of brain-based learning among science teachers at the middle school level from the perspective of educational supervisors in the educational environment axis: To identify the degree of reality of teaching practices consistent with the principles of brain-based learning among science teachers at the middle school level from the perspective of educational supervisors in the educational environment axis, frequencies, percentages, arithmetic means, standard deviations, and ranks were calculated for the responses of the research participants to the statements of the educational environment axis based on the perspectives of educational supervisors in the city of Tabuk. The results are as shown in the following table:

Table (13) Responses of the research sample to the statements of the fourth dimension (educational environment) ranked in descending order according to the agreement averages.

Paragraph	Statements	Standard Deviation	The arithmetic mean	Rank
1	Utilize the necessary devices and tools for learning to occur.	0.38	2.83	5
2	Adjust the physical characteristics of the learning environment (lighting, temperature, ventilation).	0.49	2.66	1
3	Enrich the learning environment with diverse technologies and programs related to the lesson.	0.51	2.58	2
4	Ensure the participation of all students in activities and answering questions.	0.52	2.50	8
5	Coordinate presentations with attractive colors and shapes.	0.67	2.50	4
6	Avoid the use of threats and punishment.	0.51	2.41	7

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7	Allow students the freedom to express their opinions and emotions during the class.	0.56	2.41	9
8	Encourage students to celebrate their achievements.	0.57	2.41	3
9	Encourage students to drink an adequate amount of water.	0.73	2	6
	Overall Average	0.55	2.47	

The above results indicate that the research participants agreed to a moderate extent on the alignment of teaching practices with brain-based learning principles among middle school science teachers, according to the perspectives of educational supervisors in the educational environment axis, with an average of (2.47). Through the same results, it is observed that there is consistency in the agreement of the research participants regarding the educational environment dimension, where their agreement averages ranged between (2.83 to 2), falling within the third and second categories of the three-point scale, indicating (agree - somewhat agree) with the research tool. This reveals the variation in the agreement of the research participants on the educational environment dimension, which was arranged in descending order according to their agreement as follows:

- Statement (5) ranked first in terms of agreement among the research participants with a moderate average of (2.83).
- Statement (1) ranked second in terms of agreement among the research participants with a moderate average of (2.66).
- Statement (2) ranked third in terms of agreement among the research participants with a moderate average of (2.58).
- Statement (2) ranked fourth in terms of agreement among the research participants with a moderate average of (2.41).
- Statement (5) ranked last in terms of agreement among the research participants with a somewhat agreeable average of (2).

Recommendations: Based on the research findings, the researcher recommends several actions to enhance the level of teaching practices consistent with brain-based learning principles among middle school science teachers, including:

- Utilizing brain-based learning strategies in various learning environments due to their proven effectiveness in enhancing students' academic achievement.
- Adopting training programs to increase teachers' awareness of using brain-based learning strategies in the educational process.
- Emphasizing university curricula in education colleges to increase students' awareness of the importance of using brain-based learning strategies in teaching.
- Conducting training courses, effective lectures, and workshops on teaching practices consistent with brain-based learning principles.
- Conducting further studies and research on the degree of teaching practices consistent with brain-based learning principles in other practical environments.

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- Adopting the use of brain-based learning strategies in teaching students at early educational stages so that they can master the skills of dealing with these methods and explanations.
- Considering individual differences among students according to their cognitive style when designing proposed educational programs.

Suggestions:

Based on the current research results and recommendations, the researcher suggests conducting the following studies and research:

Conducting numerous studies and research in the field of brain-based learning strategy, and investigating its impact on improving and developing academic achievement and various skills among students in other specialties.
Conducting similar research on different educational stages.
Proposing further studies that focus on building programs and strategies based on brain-based learning strategy in other researches on the middle stage and in other specialties.

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