

Scientific concepts perceptions of middle school students.

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Abstract: This study aimed at detecting misconception among second-year middle school pupils in some science units. The topics intended are 'human nutrition'; 'the green plants nutrition' and obtaining energy. To give answers on the study's questions, the study relied on the exploratory analytical approach, through building up a diagnosing test. First, its validity has been verified then applied to random samples consisting of 400 male and female pupils. After statistical processing, the study has resulted in the followings : 46.2% was the total prevalence of misconception, and to be clear enough here are the main results reached out : The teacher 53.8% the family 23.7%, the school book 12% while social media 6.8 % .

Keywords: Scientific concepts, Misconceptions, natural science subject

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1-Introduction:

Currently, we are living in an era that is “defined as the age of knowledge”, in which the technological progress is rapid & cognitive, and societies that keep pace with this are called knowledge societies, the level of these societies, is determined by their cognitive response towards this huge intellectual movement, it also is a society that depends on creating and disseminating knowledge through data networks so as to achieve sustainable development, and the abundance of existing concepts is amongst the clear features of this era, including scientific concepts, which clearly falls within this category. Before this era, these concepts had represented the totality of knowledge or an absorbed case scenario of a given subject in the human mind, which shows the level of perception and the grasping of a given idea or concept, because it contains an overall assessment and understanding to the information related to it. The existing of an inclusive perception plays a role in improving communication and interaction efficiently towards ideas and topics.

It can be said that scientific ideas are a skeleton of science and its outstanding findings, because it unifies and arranges several components, activities and incidents that creates knowledge in meaningful forms and at higher levels of abstraction, this is the basis in which laws, principles and theories are based on, as well as human interaction, since it is the basis of their initiation, and the way that shapes the sense and the accurate meaning of knowledge. It also is a mediator of communication between people, scientific phenomena and issues which hinder human development are clarified through it, so it will have a significant impact on improving the human life and his civilization (**NAWAFILA, 2016**), when a person acquires knowledge and he experiences several thoughts, he, then builds a complex mind network out of these confusion causing concepts, or even creates contradicted or incorrect concepts for him. Learner shall take into consideration the saying “if a pupil makes a mistake while learning something, then, everything they learn afterwards, and based on that mistake, will be incorrect”, and that does not end here, rather, its conclusions and judgments extend to various issues and events to which is invalid and incorrect (**El-Rashed, 2002**).

Problematics:

In the 1930s, **Jean Piaget** had the credit for the first studies related to misconceptions, when he conducted studies on children’s concepts about the universe, in addition to his works on studying students’ misconceptions dated back to the early 80s. “the learner’s experience and his previous knowledge are among the most important factors which affect the intact learning process” **OZIL 2002**. Another vital impact of educational research on misconceptions mentioned by **GEORGE KELLY** in 1969 on his theory of personal structure, which focuses on studying alternative or incorrect concepts among individuals, in which it is considered one of the most interesting personality theories ever emerge, many educational researchers have turned to studying students alternative or (incorrect) concepts about several scientific concepts, handful studies were emerged in literature educational research, and it has been shown that the students’ change resisting concepts, are fixed in their minds, the researcher here confirms that studying these concepts is essential for the educational process, because teacher must take into consideration those conceptions related to his new rubric before lesson begins. A misconception is not limited to an existing scientific fact that has been properly preserved, it is more than that. It emerges out of an existing meticulous and incomplete mental structure that lies beyond a set of concepts related to this structure which (Pathare & Pradhan, 2011) emphasized, scientific concepts as we know are the most important levels of knowledge acquired in a person’s life, in which it goes through all educational stages from kindergarten to university, where education is committed to providing learners with thinking, problem-solving, analysis and commentary and so on. Such diverse skills increases deep understanding of pupils’ cognitive content, and helps them building a strong psychological cognitive structure, however, some pupils are still suffering from incorrect scientific concepts, that natural sciences subject is rich of them, which is a subject that relies on some kind of comprehensive-based thinking that holds a special place for educators and parents, especially since it is one of the ways for students to choose their educational path in high school and university.

As known, the reasons for these misconceptions are many, we mention: (the large number of learners in a single class and the dispersion of knowledge across multiple educational subjects, and the lack of interest of some learners with the new knowledge taught to them, and that’s due, sometimes, to some teachers not wanting to teach seriously, using pedagogical documents accompanying the learning, that holds no clue according to learners, and the stuffed curricula ... etc.).

Cartoons and movies can several facts and natural phenomena, that affects the learners' understanding mostly on correct scientific conceptions, in addition to teacher's lack of experience in explaining some phenomena based on his prior knowledge (DAOUADI, 2023).

However, these reasons aren't the real ones causing the problem, old and fresh educators and see that there are some other serious problems on acquiring knowledge for the daydreaming student, who is physically present but mentally absent, that teachers do not notice, in which they do not mind, emphasis or focus on what they know, or what they think they know, into consideration, that's why and for 20 years, educational research has aimed to understand the questioning style used by learners during learning AKA:- (*interrogative / question approach*) and their way of thinking and its efficiency, all these are called: "perception" that leads to serious proper teaching methods emphasized by (MANSOUR, 2018), (ANJOM, 2001) and (BILAL, 2017) where they considered teacher's method as the most important sources and causes of misconceptions for learners, and in which this is the most effective way that will be adapted by the modern educational organization, several questions were raised upon this phenomena, its source, causes and effect on proper learning, and how can teachers address, and they are as follows:

- 1- How far natural sciences subject misconceptions do for 2nd year middle school students goes?
- 2- What are the sources of those misconceptions for 2nd year middle school students in natural sciences?

The aim of the study: this study aims at raising the teacher's awareness on the variety of the learner's alternative concepts for 2nd year middle school students on natural sciences subject, and highlighting the dangers of these false assumptions to the new learning process, where it stands as an obstacle between the learner and his acquisition of new scientific concepts correctly, and emphasizing the necessity on finding new and effective ways, methods and techniques by Algerian's education curricula designers to correct these assumptions.

The purpose of the study:

- 1- Knowing how far do natural sciences subject alternative concepts for 2nd year middle school students.
- 2- Knowing the sources that these concepts are consisting out of, for 2nd year middle school students in natural sciences subject.

Limitations of the study :

- 1- Time limits: during the month of January 2024
- 2- Spatial limits: this study is conducted in some middle school in TOUGGOURT Province, approximately: "7 middle schools "representing: the rightful genres for the study.
- 3- People limit: all 2nd year middle school students.
- 4- Objective limits: worth of three school book units were conducted for 1st year middle school of natural sciences, which are:

- (- التغذية عند الإنسان Human nutrition)
- (- التغذية عند النبات الأخضر Green plant nutrition)
- (- التحصل على الطاقة - Getting energy)

Procedural concepts

Definition of a scientific concept: it is the theoretical understanding and accurate explanation of natural and social phenomena, through the scientific curricula and logical evidence, measured by experiments backed by data, and analysis and deriving laws and theories.

Definition of misconceptions: it is a mental image that students have formed incorrectly, that affect the learner's interpretation of scientific phenomena, which can be spotted through the natural sciences exam set by teachers for the 3 units.

Theoretical framework and previous studies:

1- Misconceptions :

1-1- Definition of conception :

Linguistic meaning: "aware", noun: which is being aware of something/ the awareness towards something. The existence of a concept is a mental existence not physical, i.e.: human immunodeficiency virus (HIV / AIDS). (Kouttami, 2001)

Etymological meaning: as defined by the educational dictionary (1959) as follows: - an idea or representation of a common element between groups, categories, a substance or certain thing (BOUDJOUMOAA SALAM.2012). As for (VESKS & HEIKKINEN.2000) they define it as an explanatory principle in the scientific system. AKA: the explanation provided by the learner himself, in which the sense will be shown upon the concept (ANJUM NAZ.2001).

1-1- Definitions of scientific concepts: a mindset that leads to the understanding of natural & physical phenomena ties, explained as abstract formulas, using clear symbols, names and terminologies that differs from one to another (MANSOUR2014).

1-2- Definition of misconceptions: known as those thoughts learner has, unlike its definition by scientists (OTHER) and (POSNER) define it as the concept contradicted to existing scientific theories, (VATANSEVER) says it is a set of conceptual representations unrelated to a certain cognitive field. AKA a learner's perception or a cognitive structure that neither helps nor go with familiar knowledge (BAKKAR 2022). It is ideas that resist change, contradict science and hinder learning new concepts (MARLIN ET ALL, 2020) misconceptions are learners' beliefs that contradict scientific knowledge, these misconceptions hinder students from understanding and connecting scientific phenomena. Natural sciences form the foundation of experimental sciences, covering biology, earth sciences, physics, chemistry, astronomy and interdisciplinary fields like geophysics, biophysics and biochemistry.etc., it also consists biology, geology and it is applied in several fields like agriculture, medicine, environment biotechnology and others.

Characteristics of misconceptions: misconceptions have a dual nature (WA'ALI2010) mentioned that they can hinder learning by creating barriers to understanding, yet they also serve as cognitive tool that, despite being incorrect, it contributes to the learning process, this allows the teacher to identify and correct misconceptions or refine them. Secondly, misconceptions are complex, as they involve numerous interwoven concepts like perception, awareness, the way of thinking and creativity, additionally; misconceptions vary from a student to another due to every individual's difference. Each student's mental image of a certain concept is shaped by their unique experiences, sensory perceptions and ways of thinking according to their environment they live in, misconception can as well be general, shared by society through cultural, social, religious beliefs, especially shaped by individuals' understanding. A key feature of misconception is their dynamic nature, they evolve through learning. Additionally, environment and time play a major role in shaping perception through a students' interaction with their social and cultural surroundings as claimed by (MOUSSTAFA MANSOUR, 2018), as the learner gives a mental image on misconceptions in real life according to how it is analyzed in his unconscious mind.

2- Sources of learners' misconception: studies have confirmed that misconceptions often stem from textbooks, especially English language scientific books, which students struggle to interpret. This leads to misunderstandings, especially when Arabic books are lacking or school textbooks lack clear explanations, the language used by textbook authors contributes to misconceptions if it doesn't match the learner's cognitive level. Another source is the teacher who's considered as the basic element or source in providing the information. The person delivering content shapes learners' knowledge through appropriate methods and strategies. If the teacher lacks the necessary teaching competence, they can become a source of misconceptions for his / her students. Studies have shown that some teachers hold misconceptions about scientific concepts, due to insufficient training or lack of familiarity with the subjects they teach. Learners can also be a source of misconceptions, as interactions may show or reveal these misunderstandings, they also can reinforce misconceptions through interacting with each other and their environment, leading to incorrect understandings of certain concepts. These misconceptions may conflict with the correct concepts taught in the classroom. Traditional teaching methods often fail to correct students' misunderstandings of scientific concepts, which lack using experience and scientific experiments in clarifying it (ABD ESSALAM, 2001). The lack of essential educational resources for experiments prevents students from understanding and connecting theoretical scientific concepts to real-

life applications, relying on assessment methods that only test memorization without encouraging dialogue about students' mistakes, makes evaluation ineffective and meaningless (BAYOUMI, 2003) also been emphasized by (WOORD, 1996). Studies have shown that a link between a learner's cognitive development and academic achievement. Misconceptions arise when scientific concepts do not align with students' cognitive level, along with individual differences in knowledge acquisition and intelligence.

3- How to diagnose learners' alternative concepts:

Detecting misconceptions is considered a serious problem, since educators and researchers try to solve, diagnosis is the main key in finding the solution, a suitable environment is essential for accurate identification and diagnosis of misconception, followed by effective correction using modern strategies. One of the key methods for identifying misconception is "concept mapping", where students are given a set of concepts and asked to create a diagram showing the relationships between them, in which the missing concepts are identified. Another method is "free classification, where students are given a set of concepts and asked to categorize them in multiple ways, without tying them with a time constraint. Objective testing come in various types and we list the main ones and a multiple selection test, which we adapted in our study. It requires students to select the correct answer from multiple choices, where there are (3 / 4) choices, one of the main advantages of this test is reducing guessing and providing flexibility, it also measures both simple and complex learning outcomes. Another method is ' free association' where students are given a concept and asked to write a certain number of guesses or ideas that come to mind within a set time limit, brainstorming and classroom discussions are also effective, allowing learners interacting and exchanging ideas, as an addition to this, direct interactions and question asking with individual students help assess their understanding of specific concepts, and when a student answers, they are asked to explain and provide more detailing on their choice, helping to identify any misconceptions (KHATAIBIA & EL-KHALIL) describe several methods for identifying misconceptions, including pre-tests or diagnostic assessments, where students take a test before learning to reveal existing conceptual errors, also , the "observe and explain" method , where students are given a description of an experiment and they are asked to predict the outcome. The experiment is then conducted, and they observe any similarities or differences, explaining their reasoning. (ABOU MOUSSTAFA, 2017).

4- The importance of students' misconception diagnostics:

Studies have shown that discovering and correcting misconceptions has great value in linking different knowledge logically and hierarchically and poses a significant risk when they remain in learners' mind, so that knowledge develops based on it. (ATEER, 2023)'s study has shown that implementing teaching strategies is capable of changing those beliefs (NOUHA, 2023). Also (MARILYN AULT PICKING) (ERT ROGIER DONDEERS) (JEN. J Kollouss2020)'s study which identifies misconceptions in medical students' questions. (MARILYN ET ALL, 2020) in addition to the study of (DOUADI, RYAN and DJEBALLI, 2020): showed that the alternative experiment strategy had an impact on correcting misconceptions, according to the post-test results (DAOUDI ET ALL, 2020) in addition to the study of (MOUSSTAPHA MANSSOUR) that proved the prevalence of alternative conceptions among students and their sources. (NINY HIRMETTA, 2018) 's study aimed to" investigate the potential misconceptions of pre-service teachers about direct current electrical circuits", the results showed several misconceptions related to the concept of direct current electricity, including the belief that electric current flows through the conductor due to the movement of positive charges, from the positive terminal of the battery to the negative one, and the misconception that electrons flow at extremely high speeds in an electric circuit, approaching the speed of light. Another misconception is that adding more batteries in a series circuit increases the number of electrons, leading to an increase in the electric current in the circuit (NINI HIRMETTA, 2018)

The practical framework of the study

- 1- **Study methodology:** There researcher adopted the descriptive, exploratory and analytical approach due to its suitability for the nature of the topic, which aims to determine the prevalence of misconceptions for 2nd year middle school students in certain units of natural sciences subject.
- 2- **Population "society" and the study sample:**

The study population consisted of middle school students from various middle schools across **TOUGGOURT province** and its suburbs, totaling 7 schools. A simple random sampling method was used to select a sample of 400 student, distributed as (214 male students) and (186 female students).

3- Study procedures: To answer this study questions, the research was conducted following a series of systematic scientific steps. First:

- The principles of the selected middle schools were contacted to arrange the test and schedule it according to the specific time and availability of each school.
- The study sample was selected randomly by choosing 1 or 2 classes from each of the 7 middle schools where the study was conducted, depending on the available conditions.
- The research was carried out with the cooperation of various teachers of both scientific and literary subjects, who showed great willingness to collaborate, after showing them how it should be done.
- The test was distributed on the students, explained to them, and accompanied by the necessary guidance and clarifications; supervision was provided to ensure that any questions from them were answered.
- After the test was administered, the answer sheets were collected and graded according to the predetermined scoring key, where (1 point) was given to each correct answer, and (0 points) for each incorrect answer.
- Afterwards, the test results were subjected to statistical analysis immediately.

4- Study tool:

After analyzing the content of the natural sciences subject for 2nd year middle school students, we identified the topics on which the test questions would be based. We, then, adopted multiple-choice questions and prepared 15 items after calculating the difficulty index, ease Index and the discrimination index, the test had a predetermined duration and was administered in a single session lasting (45 minutes), equivalent to a regular class period in middle school. Three (3) questions were selected from the 1st unit (Human nutrition التغذية عند الانسان), six (6) questions from the 2nd unit (Green plant nutrition- التغذية عند النبات الأخضر) and six (6) questions from the 3rd unit.

5- Presentation and discussion of study results:

5-1 – presentation and discussion of the 1st query results: This examines “the prevalence of alternative concepts among 2nd year middle school students in natural sciences subject”:

TABLE n° (1): presents the frequencies and percentages of alternative concepts among 2nd year middle school students in some of the selected units of natural sciences subject:

N°	Concepts	Correct concepts		Incorrect concepts		Students answers					
						A		B		C	
		Repetition	%	Repetition	%	Repetition	%	Repetition	%	Repetition	%
01	Dietary intake	332	83	68	17	20	05	48	12	332	83
02	Starch	312	78	88	22	312	78	44	11	44	11
03	Malnutrition for humans	214	53.5	186	45.6	155	38.8	31	7.8	214	53.5
04	Nutrient solution	176	44	224	56	101	25.3	123	30.8	176	44
05	Germination process (seed germination)	219	54.8	181	45.3	219	54.8	76	19	105	26.3
06	Photosynthesis process	232	58	168	42	92	23	76	19	232	58
07	Absorptive hairs (Root hairs)	212	53	188	47	212	53	69	17.3	119	29.8

08	Transpiration phenomena	180	45	220	55	126	31.3	94	23.5	180	45
09	Phloem	268	67	132	33	268	67	67	16.8	65	16.3
10	The respiratory system	167	41.8	223	58.3	194	48.5	39	9.8	167	41.8
11	Respiratory gas exchanges	104	26	296	74	235	58.8	61	15.3	104	26
12	Walking speed	212	53	188	47	103	25.8	85	21.3	212	53
13	Breathing equation	174	43.5	226	56.5	120	30	106	26.5	174	43.5
14	Muscle	200	50	200	50	72	18	128	32	200	50
15	Pathogens	224	56	176	44	119	29.8	57	14.3	224	56
Total		3226	53.8	2774	46.2	2348	39.1	1104	18.4	2548	4.25

From table (01), we observe the frequencies and percentages of each alternative misconception among the students, listed in order as follows:

- 1- Dietary intake:** we observe that the percentage of students who chose alternative “A”, which defines it as the amount of food consumed by a person over (24 Hours), reached 5%, meanwhile, alternatives “B” and “C”, which define it as the amount of food consumed over (12 Hours) and (24 Hours) respectively, had their own corresponding percentages (12%) and (83%), where alternative “C” represents the correct concept.
- 2- Starch:** we observe that (78%) of students selected alternative “A”, which represents detecting starch using “iodine”. meanwhile, the incorrect alternatives “B” and “C” accounted for 11% each. Thus, alternative “A” is the correct concept.
- 3- Malnutrition for humans:** the percentage of students who chose the correct alternative “C”, which represents (Marasmus and all previously mentioned conditions), was 53.5%. Meanwhile, the incorrect alternatives “A” and “B” (*Kwashiorkor, Anemia and Goiter*), were chosen by (38.8 %) and (7.8 %).
- 4- Nutrient solution:** the results showed that the correct alternative “C”, which represents all the previously mentioned elements, was chosen by (44%) of students. Meanwhile, the incorrect alternatives “A” and “B” (*water, nitrogen, phosphorus and potassium*), were respectively selected by (25.3%) and (30.8 %).
- 5- Germination process (seed germination):** we observe that the percentage of the correct alternative “A”, which represents (*the germination process as the emergence and growth of a plants’ seed*), was (54.8%), meanwhile, the incorrect alternative “B” and “C” (*plant growth process, photosynthesis process*), were chosen by (19%) and (26.3 %).
- 6- Photosynthesis process:** we observe that the correct alternative “C” which represents and shows (that photosynthesis process is a vital process done by green plants in the presence of *light and Carbon Dioxide² and chlorophyll*) was (58%), while the incorrect alternatives “A” and “B” (*a vital process done by green plants in the presence of Carbon Dioxide², or in the presence of only light by itself*) was (23%) and (19%).
- 7- Absorptive hairs (Root hairs):** the percentage of the correct alternative “A” which states that (*root hairs are the site where the green plant absorbs the nutrient solution*) has reached (53%), when the incorrect alternatives “B” and “C” stating that (*root hairs absorb botanical solution or water*) are as follows (17.3%) (29.8%).
- 8- Transpiration phenomena:** the percentage of the correct alternative “C” which states that (*transpiration is the process in which a plant releases excess water*) has reached (45%), while the

incorrect alternatives percentage “A” and “B” which state that (*transpiration is the process in which a plant releases Carbon Dioxide gas or releasing Oxygen gas*) are as follows (23.5%) and (45%).

- 9- **Phloem:** the percentage of the correct alternative “A” which states that (phloem is a nutrient liquid which consists of mineral salts, water, and everything resulting from photosynthesis process) has reached (67%), while the percentages of the incorrect alternatives “B” and “C” which state that (phloem is a process in which a plant releases CO₂ or releasing O₂) has reached (16.8) and (16.3).
- 10- **The respiratory system:** the percentage of the correct alternative “C” that represents (all the previously mentioned) has reached (41.8%) while the percentages of the incorrect alternatives “A” and “B” which state that (the respiratory system consists of only two 2 lungs, or it consists of only respiratory tracts) are as follows (48.5%) (9.8%).
- 11- **Respiratory gas exchanges:** the percentage of the correct alternative” C” which states that (*respiratory exchanges occurs on the level of pulmonary alveoli*) has reached (26%), while the percentages of the incorrect alternative's “A” and “B” (*occurs at the level of lungs, trachea*) has reached (58.8%) and (15.3%)
- 12- **Walking speed:** the percentage of the correct alternative “C” which states that (oxygen consumption and the respiratory rate) has reached (53%), while the percentages of the incorrect alternatives “A” and “B” (respiratory rate, the speed of walking and the consumption of oxygen) were (25.8) and (21.3%).
- 13- **Breathing equation:** the percentage of the correct alternative “C” which assumes that (*in case of the presence of O₂ and glucose produces energy, CO₂ and water vapor*) was (43.5%), while the percentages of the incorrect alternative's “A” and “B” (in case of the existence of energy and O₂ then it produces either glucose and CO₂ or glucose, CO₂ and water vapor) and it was as follows (30%) and (26.5%).
- 14- **The muscle:** we observe that the percentage of the correct alternative “C” which represents (muscle consumption of glucose and O₂ and it produces energy and releases CO₂ and air) has reached (50%), while the percentages of the incorrect alternative's “A” and “B” (*either glucose consumption only, or O₂, and then it produces energy and air*) were (32%) and (18%).
- 15- **Pathogens:** we observe that the percentage of the correct alternative “C” which represents (the *direct contact with the sick*) has reached (56%), while the percentages of the incorrect alternative's “A” and “B” (*eating, practicing sports*) were (29.8) and (14.3 %).

5-2- Discussing the results of the 1st query:

The percentage of misconceptions among 2nd year middle school students in natural sciences subject reached (46.2%), while the percentage of correct concepts was (53.8%). Although the correct concepts outweigh the misconceptions it doesn't mean that most student are free from misunderstandings, the findings indicate that misconceptions are still significantly present among students. Their prevalence can be attributed to several factors, the most important of which are individual differences and students' varying levels of intelligence, each student has his own mental capacities, in addition to the techniques and ways teachers provide during the explanation, for instance not using technological methods like “PowerPoint” which attracts students' attention during class, brainstorming and the student's environment also may lead them to acquire inaccurate vocabulary, affecting their understanding of surrounding phenomena, perceptions can evolve during the learning process, leading to a restructuring for the initial cognitive framework. Misconceptions are dynamic and ever-changing, so ignoring them creates learning barriers. Therefore, learners should be placed in real-life situations where scientific facts are presented, especially in natural sciences, which requires the students to focus on understanding when attempting to explain a scientific phenomenon. For instance, (SABRINI-2016) study indicated (36) alternative conceptions within a single life sciences unit for 9th grade, similarly, the study of (NOURA AL-JABRIN & ABDELKARIM, 2017) examined the prevalence of misconceptions about “Genetics” among middle school science teachers, and the results revealed a high occurrence of misunderstandings regarding concepts such as “Chromosomes, Genes, DNA,

RNA, Traits, Dominance, Genotypes and Phenotypes”. For example, our study found that students often confuse respiration with gas exchange, with the latter being the most common misconception at a rate of (77%), where respiration refers to a scientific process, while gas exchange specifically describes where the process occurs at the pulmonary level. Students do not distinguish between the components of the human lungs, which is due to teachers simplifying respiration as merely inhalation and exhalation occurring in the lungs without clearly specifying its actual location. Our study aligns with the findings of (MUSTAPHA MANSOUR,2018) & (NOUHA ISMAIL,2023) (ABOU MUSTAPHA BILAL,2017) in addition to (ABD EL-HALIM & ALI FARES, 2021) (NINA HERMITTA, 2018) last but not least (ANJOM NAZ.2000) in confirming the prevalence of misconceptions among learners, regardless of their age or academic level.

5-3- Discussing the results of the 2nd query: which examines the sources of misconceptions among 2nd year middle school students. To answer this query, we calculated the frequencies and percentages for each potential source contributing to the spread of misconceptions among students.

Table (N° 4) illustrates the frequencies and percentages of sources of misconceptions among 2nd year middle school students in various units of natural sciences subject:

N°	Concept	Mis conception sources among students							
		Teacher		Students' school book		Family		Social media platforms	
		Repetition	%	Repetition	%	Repetition	%	repetition	%
1	Dietary intake	215	53.8	48	12	113	28.3	24	6
2	Starch	223	55.8	63	15.8	93	23.3	21	5.3
3	Malnutrition for humans	201	50.3	72	18	108	27	19	4.8
4	Nutrient solution	211	52.8	70	17.5	89	22.3	30	7.5
5	Germination process (seed germination)	214	53.5	77	19.3	83	20.8	26	6.5
6	Photosynthesis process	228	57	68	17	88	22	16	4
7	Absorptive hairs (Root hairs)	224	56	61	15.3	88	22	27	6.8
8	Transpiration phenomena	214	53.5	73	18.3	88	22	25	6.3
9	Phloem	210	52.5	65	16.3	95	25.8	30	7.5
10	The respiratory system	215	53.8	63	15.8	94	23.5	28	7
11	Respiratory gas exchanges	211	52.8	75	18.8	86	21.5	28	7
12	Walking speed	216	54	58	14.5	99	24.8	27	6.8
13	Breathing equation	202	50.5	71	17.8	92	23	35	8.8
14	Muscle	197	49.3	74	18.5	93	23.3	36	9
15	Pathogens	203	50.8	51	12.8	112	28	34	8.5
result		3184	53.1	989	16.5	1421	23.7	406	6.8

From the table (03), we observe that the source of misconceptions among students play a significant role in shaping inaccurate understandings of correct concepts, these sources include the teacher, the textbook, the family and social media. Below, is an analysis and discussion of each source:

- 1- The teacher:** we observe that the teacher significantly contributes to the formation of misconceptions among students, with (53.1%) considering him as a source of inaccurate understanding. This is

primarily due to the teacher's focus on delivering information in a traditional manner within a limited timeframe. Additionally, the intensive curriculum structure negatively impacts students' deep comprehension of scientific concepts, teachers may also introduce scientific concepts to students without connecting them to their prior knowledge, which can lead to the emergence of alternative understandings of correct scientific concepts, as some studies have indicated, like the study of (MUSTAPHA MANSOUR, 2018) and (ABOU MUSTAPHA, 2017) which highlights that teachers play a significant role in shaping students' misconceptions. As the cornerstone of the educational process, students tend to trust information provided by their teachers, considering them the primary source of knowledge. If the teacher holds misconceptions, lacks clarity, or doesn't employ effective teaching methods to convey information, these misconceptions are naturally transferred to the students. Our study aligns with the study of (NOURA AL-JEBRINE & SALEH ABD ALLAH, 2017) which emphasized the role of science knowledge in shaping *Genetics* concepts among middle school female students.

- 2- **The textbook:** the table indicates that the textbook is also a source of misconceptions among learners, despite its relatively low percentage of (16.5%), while not a high figure, yet, it remains a notable factor in the information of misconception. This can be attributed to the fact that when some students struggle to grasp scientific concepts inside the classroom, they turn to the textbook for review. However, this may lead them to develop alternative understandings of the intended concepts, where some literary studies have attributed the formation of misconceptions among students in natural sciences to the school text book, like (ZAITUNE, 1998), some studies have also confirmed this consistent finding, including the study of (MANSOUR, 2018) and (EL-NASHERY, 2008) on which science textbooks contributes in forming misconceptions or misunderstandings among students.
- 3- **The family:** the family's role in shaping misconceptions among students accounts for (23%), a significantly notable percentage. On the positive side, this reflects parents' dedication to their children's education, awareness and guidance throughout their academic journeys. However, it doesn't eliminate the fact that family can also be a source of misconceptions. Students often encounter certain concepts through observation or explanations provided by family members. While the intention may be to simplify the concept for easier understanding, an inaccurate or altered explanation can lead to the development of alternative misconceptions. (MANSOUR, 2018) highlighted that a child's surrounding environment plays a huge role in shaping their misconceptions.
- 4- **Social media:** the table shows that social media contributes to the formation of misconceptions among students at a rate of (6.8%). While this percentage is low somehow, yet it remains significant in influencing students' understanding. We live in a technological era rich in knowledge and digital tools that facilitate access to various terms and concepts. Television, with its diverse programs, and the internet provide numerous sources of information. When students face confusion of a concept, they often turn to search engines like "Google" or "YouTube" for clarification. However, the way concepts are presented varies from one to another, which can lead to both understanding and misinterpretation of the scientific concept intended to be comprehended, this aligns with (MANSOUR, 2018) study, which found that the formation of scientific misconceptions is influenced by students' exposure to the fast-paced style of commercial advertisements and their lack of focus while watching the programs. Whether in the form of cartoons or educational shows, the content may present scientific information that is either accurate or inaccurate, ultimately leading to the development of misconceptions.

conclusion & findings: misconceptions, ideas, beliefs or inaccurate perceptions are mental representations formed in students due to various factors, including the curriculum, textbooks, and their prior knowledge. A

crucial factor “the teacher” as the leader of the educational process, along with the family and the student’s social environment. Our study revealed that 2nd year middle school students hold misconceptions in natural sciences, particularly in units of (Human nutrition) (Green plant nutrition) & (Getting energy), with a prevalence rate of (46.1%), where researches indicate that when misconceptions exceed (30%) it signal a widespread issue in students’ understanding. The study results indicated that teachers contribute (53.2%) to the formation of students’ misconceptions, followed by textbooks at (16.5%), families at (23.7 %) and social media at (6.8%), therefore, it is essential to carefully verify the information before it turns into a misconception that contradicts to the correct concept. Additionally, emphasis should be placed on selecting modern teaching methods that align with scientific subjects, incorporating experiments and scientific reasoning to reinforce accurate understanding.

study recommendations: based on the findings, we hereby emphasize the importance of addressing misconceptions among learners and identifying them through objective assessments, especially multiple-choice tests, which help reveal students’ understanding of scientific concepts. Teachers should adopt diverse teaching methods instead of relying on rote learning, encouraging students' engagement through discussion and interaction for better outcomes. Additionally, misconceptions should be promptly corrected to prevent further confusion or the development of additional misunderstandings.

References and Referrals:

Al -Maliki, Jawad and Al -Haidari Muhammad (2020). The effect of a model from Wayne on amending the wrong understanding of chemical concepts, Fourth Preparatory Students. Basic, 15 (4). 396-423.

Al -Farkahi, Mustafa Riyad and Al -Abadi, Amal Fattah Zidan (2019), the impact of the strategy of scientific stations on amending the wrong understanding of scientific concepts among the first intermediate graders in science. Faculty of Basic Education Research Magazine. 15 (4).709-734.

Al -Abed, Nasser Ahmed and Al -Sabrini, Muhammad Saeed. (2018).the effect of the use of the circular house strategy in collecting and amending alternative perceptions in life sciences among the ninth grade students in Jordan, Journal of the Islamic University for Educational and Psychological Studies. 26 (01).536-560.

Abu Mustafa Bilal (2017). entitled wrong perceptions of thermal dynamic concepts among students of the Department of Chemistry at Al -Aqsa. University in Gaza and depicting the therapeutic proposal. unpublished Master Thesis, College of Education of the Islamic University.

Al -Nawafla, Walid Hussein; Khalaf, Mahmoud Hassan Al -Momani, Amal Rashid (2016), alternative concepts related to the concepts of heat and temperature among students of physics specializing at Yarmouk University. Journal of Educational Sciences Studies.43 (3).

Al-Rashed Ali bin Ahmed, (2002), The wrong scientific concepts of students of the scientific department at the College of Teachers in Riyadh. Journal of the College of Education. 17 (19).35-65.

Abdel-Alim Mazouz and Ali Faris (2021) alternative perceptions in the subject of natural sciences and life among first-year students average in light of some variables, a field study, the researcher’s journal in the humanities and social sciences-volume 13 (04). Algeria: Qasdi Mirbah University, 37-54.

Bakkar Muhammad (2022). E learners misconceptions and their effects on their cognitive achievement and concepts. The Higher School of Professors Buraza. Educational and educational research magazine.11 (02). 201-224.

Al-Rashed Ali bin Ahmed, (2002), The wrong scientific concepts of students of the scientific department at the College of Teachers in Riyadh, *Journal of the College of Education*. Volume 17 (19). 35-65.

Bakkar Muhammad (2022). E learners misconceptions and their effects on their cognitive achievement and concepts. *The Higher School of Professors Buraza. Educational and educational research magazine*. 11 (02). 201-224.

Bilal Musa Ibrahim Abu Mustafa. (2017) .The wrong perceptions of the concepts of thermal dynamics among students of the Department of Chemistry at Al -Aqsa University in Gaza and depicting a proposal for its treatment, Master Thesis, College of the Islamic University of Gaza.

Boujemaa, Salam .(2012) .teaching and learning scientific concepts, subject of life and nature, model, *Journal of Humanities and Social Sciences*. (8) 76-59.

Bayoumi Mustafa (2003), common mistakes in writing the chemical equation of Arab teachers and third - grade middle school students, studies in the curricula, the third scientific conference held in Ismailia. the Egyptian Association for Practical Education.

Dawadi Zahra, Rayyan Sayed Ali and Jamal, Jaafar (2020). The effect of the use of alternative experiments in correcting misconceptions, concepts, the physical transformation of students of intermediate education in Algeria, " *Journal of Psychological and Educational Sciences: Volume*. 6 (3). 14-31.

Fatima Salem and Nour Al -Najjar (2018). The effect of the use of cognitive contradiction strategy on amending alternative perceptions of geographical concepts in the subject of social studies among tenth graders and their trends towards the subject. *Journal of Psychological and Educational Sciences*. Sultan Qaboos University, Sultanate of Oman. 13 (1). 87-88.

Mansour, Mustafa (2018) alternative perceptions among the students of the fourth grade average in some physical concepts, *Journal of Psychological and Educational Sciences- Volume* 7 (2), 428-449.

Mansour Mustafa (2014). The importance of scientific concepts in teaching science and their learning difficulties, *Journal of Studies and Social Research*.(20). 88-108.

Miftis Mustafa, Mayor Ali, and Gerges Nagy. (2016) .entitled " The effectiveness of an electronic program based on Van Hinle theory in correcting the wrong understanding of the physical concepts of third - grade students of the scientific secondary school ", Fayoum University *Journal of Educational and Psychological Sciences*. 1 (6). 1-29.

Noha Ismail Atir (2023). The misconceptions in science among students of the College of Science at Palestine Technical University Khadouri (2023) .*Journal of Educational and Educational Sciences* (49-26). 7 (20) .

Hermita, Neni, Isjoni, Asep Suhandi, Euis Syaodih, Ahmed Samsudin, Candra Rochman, & Fitriani Rosa. (2018). Investigating prospective preservice teacher's misconceptions of direct current electric circuits. In *Proceedings of the First Indonesian Communication Forum of Teacher Training and Education Faculty Leaders (ICE 2017)*, Advances in Social Science, Education and Humanities Research (Vol. 174, pp. 361-363). Atlantis Press.

Marleen Olde Bakkink, (A. R. T) Rogier Donders, Jan G. Koolipos, Rob M. W. de Waal and Dirk J. Ruiter (2016). Uncovering students' misconceptions by assessment of their written questions. *BMS BMC Medical Education*.

Naz, A. (2008). An investigation of misconceptions of biology students at secondary level and effectiveness of inquiry approach as conceptual change instructional strategy (Doctoral dissertation). Institute of Education and Research, University of the Punjab, Lahore.

Zahra Dawadi (2023). Addressing the wrong perceptions of students related to the concept of heat in secondary education in Algeria, the educational research magazine, volume 12 (01), 497-516.