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Artificial Intelligence and the Teaching of Arabic: The Design of Mind Maps as a Model

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Abstract

Artificial intelligence (AI) has made inroads into nearly every field of life, to the point that some now believe it rivals — and even threatens — human beings, since it is capable of taking over and performing the various tasks assigned to people, sometimes more proficiently than they do. Teaching is one of the most recent of these tasks.

This raises the following question: what is the truth behind this claim, and to what extent is artificial intelligence able to substitute for the human mind in carrying out different activities and tasks?

This paper attempts to answer that question by shedding light on one of the creative applications of artificial intelligence — the drawing of mind maps — which plays an important role in facilitating the teaching process.

Two topics were chosen for consideration: the characteristics of Arabic sounds, and Arabic relative pronouns. The aim is to examine what artificial intelligence can offer in the way of educational mind maps on these topics, to compare its output with maps produced by the human mind, to identify the merits of each, and to determine which is more effective in the educational process, in an attempt to answer the questions raised above.

The result was that, despite the facilities and incentives that artificial intelligence offers, it cannot replace the human teacher, given the particular — indeed sensitive — nature of education as a subject.

Keywords: Artificial intelligence; Education; Arabic language; Mind maps; Design.

Introduction

The industrial revolution and the scientific and technological progress that followed it produced a digital revolution that gave birth to artificial intelligence — a phenomenon that has since



swept through fields as varied as economics, administration, the military, space science, medicine and entertainment, to the point that artificial intelligence has become a pressing necessity in our lives.

Only a few years ago we were watching films about artificial intelligence and the dominance of technology; today we are living that very revolution. The prophecy has come true, and fiction has become fact. Artificial intelligence has continued its spread until it reached a highly sensitive field: education — an inevitable outcome of the rapid developments the world is witnessing.

Artificial intelligence, then, has become present in the field of education as in others, and has turned into a serious rival to the teacher through the attractive services it offers — chief among them easy access to information, speed of processing, and the various applications and programs it places in the hands of its users, among them mind maps, which this paper sets out to examine under the title “Artificial Intelligence and the Teaching of Arabic: The Design of Mind Maps as a Model.”

The foregoing leads us to the paper's central question: to what extent does artificial intelligence — through the smart programs and applications it offers, mind-map design among them — influence the educational process? This is accompanied by the following sub-questions:

- What is the concept of education, and what are its conditions?
- What is meant by artificial intelligence, and what are its most important features?
- How can this non-human form of intelligence be invested in teaching human beings?
- What is meant by mind maps, and how effective are the models artificial intelligence produces, in general and in the teaching of Arabic in particular?
- To what extent are those responsible for education proficient in the techniques and applications of this new field?
- Can we reach a point at which the human teacher can be dispensed with altogether?

This set of questions will be addressed through a plan that begins with an introduction defining the key terms of the study — education and its conditions, artificial intelligence and its most important applications, and mind maps — followed by the applied study, in which the mind maps proposed by the AI programs ChatGPT and Whimsical are presented alongside human-made maps for teaching two topics: the characteristics of Arabic sounds, and relative pronouns. The results obtained are then compared in order to answer the questions raised above.

As for methodology, the study adopts a descriptive-analytical-comparative approach, as required by the nature of the topic. Among the key references relied upon are: General Teaching Methods by Tawfiq Ahmad Mar'ī and Muhammad Mahmūd al-Ḥīlah; Analysis of the Educational Process — An Introduction to the Science of Teaching by Muhammad al-Darjī; How to Draw a Mind Map: The Super Thinking Tool That Will Change Your Life by Tony Buzan;

and Artificial Intelligence: Its Reality and Future by Alain Bonnet, translated by Ali Sabri Farghali, among other sources.

1. Education

1.1 Concept

Education is present in our lives in various forms — general, vocational, or academic — and accordingly has been defined in more than one way. Among the definitions offered are the following:

- “A set of communicative acts and decisions made deliberately or systematically, to be used and employed in a purposeful way by a person or group of people, within the framework of a pedagogical, educational situation that they enter as mediators” (Al-Darj, 1991, p. 11).
- “A task placed on the shoulders of an individual or a group to help the learner achieve the intended goal” (Fatīm & Abd al-Mun‘im, 1981, p. 198).
- “The provision of the material and psychological conditions that help the learner interact actively with the elements of the educational environment in the learning situation, and acquire the experience, knowledge, skills, attitudes and values that this learner needs and that suit him, by the simplest possible means. This means that the teaching process is one in which a learner is placed in a learning situation, possessing the mental and psychological readiness to acquire experiences, knowledge, skills, attitudes and values commensurate with his abilities and readiness, through his presence in a learning environment that includes educational content and a teacher, and teaching aids, in order to achieve the desired educational goals” (Mar‘ī & al-Ḥilah, 2002, pp. 55–56).
- “An organized activity subject to planning, and to the drivers that set the process in motion, together with the set of means adopted and the goals intended to be achieved through it” (Nawwari Saoudi, 2012, p. 15).

From the foregoing it can be said that education is a purposeful activity carried out by the teacher, whose aim is for the learner to acquire new knowledge, activities, behaviors, or skills, or to modify already-acquired ones that require adjustment. This cannot take place except through the presence of the elements of the educational process — namely the teacher, the learner, the instructional material, and the teaching aids — nor can it take place except where certain conditions are met, some relating to the learner, some to the teacher, and others to the subject of instruction, i.e. what is known as the instructional material and its aids.

1.2 Conditions

For the educational process to take place properly, a number of conditions must be met: some relating to the learner, some to the teacher, and others to the instructional material and to the teaching aids.

1.2.1 Conditions relating to the learner

As the pivot of the process, the learner must meet a set of conditions, summarized as follows:

- Motivation and readiness: the learner must have the psychological readiness to receive instruction.
- Maturity: the learner must have reached an age at which he is physically and psychologically prepared to enter the educational process. The difference between this and motivation is that maturity is not tied to a specific age, since a learner may be of the age of learning yet, for certain reasons, not be ready — in other words, may lack the motivation.
- Practice: the learner must not be satisfied with cognitive or behavioral attainment alone, but must reinforce it through continued practice in various situations, so that what has been learned is not lost.

1.2.2 Conditions relating to the teacher

Among the most important conditions the teacher must meet in order to succeed in his instructional tasks are:

- Being qualified to carry out the educational process, whether academically — possessing a thorough grasp of his field in terms of knowledge and skills — or physically and psychologically, i.e. being free of physical disabilities or psychological problems that would impede or negatively affect the teaching process.
- Flexibility in dealing with learners and the ability to accommodate them and resolve the learning difficulties they face.
- Keeping pace with all developments likely to affect the educational process, including technical and computer-related aspects and their applications.

1.2.3 Conditions relating to the instructional material

A number of conditions must be met in the instructional material for it to be received well by learners. Chief among them:

The material must be accurate, and connected to the learners and to the environment in which they live, so as to attract their interest; it must be arranged in logical order, suited to the time allotted for learning, and linked to prior knowledge (Ahmad, 1999, pp. 55–56).

In addition, the material must be appropriate to the learner: neither so far above his level that he cannot understand it, nor so far below it that repetition dampens his motivation. It must also be clear and free of ambiguity or complexity that would make the educational process difficult for both teacher and learner.

1.2.4 Conditions relating to teaching aids

Teaching aids consist of anything likely to help the teacher in his work; they are therefore a support, and can never replace or dispense with the teacher. Among their types are audio,

visual, and audio-visual aids. For teaching aids to be of benefit in the educational process, they must be closely and genuinely tied to the instructional objectives. As has been noted, "the best use of teaching aids, and the clear identification of their purpose in the mind of the student, leads to increased positive student participation in acquiring experience and developing the capacity for precise observation and for following scientific reasoning ... We also see that teaching aids allow teaching methods to be varied so as to address individual differences" (Jaloub, 2016, p. 55).

As is well known, learning — for the student or otherwise — passes through three basic stages: acquisition, storage, and retrieval. To facilitate these three processes, a range of teaching methods has emerged, each attempting to adopt varied means to achieve the goals of learning; among them is reliance on mind maps, and on artificial intelligence, which has come to be relied upon heavily in education, giving rise to educational programs and various applications — and even, one might say, virtual teachers.

2. Artificial Intelligence

2.1 Concept

As a subject that attracts the attention of everyone, regardless of their cognitive orientation, artificial intelligence has been given many definitions. Among the things said in an attempt to define it:

"Artificial intelligence (AI) is the theory and development of computer systems able to perform tasks that historically required human intelligence, such as recognizing speech, making decisions, and identifying patterns. AI is an umbrella term covering a wide range of technologies, including machine learning, deep learning, and natural language processing (NLP)" (Staff, 2023).

Alain Bonnet describes it as follows: "The science of artificial intelligence aims to understand the nature of human intelligence by building computer programs able to simulate intelligent human behavior. The ability of a computer program to solve a problem or make a decision in a given situation — based on a description of that situation — means that the program itself finds the way it must follow to solve the problem, or the path leading to the decision, by drawing on the many varied inferential operations with which the program has been supplied. This is considered an important turning point, one that goes beyond what is known as 'information technology,' in which the inferential process is carried out by a human being, and in which the main reason for using the computer is its exceptional speed" (Bonnet, 1991, p. 11).

In addition, "artificial intelligence is a branch of computer science concerned with developing traditional systems that imitate the characteristics of human intelligence; it therefore relies on understanding behavior and analyzing it, as well as on training, learning and inference, in order to solve problems and improve the performance of traditional programs. It enters into several

fields, such as mobile phones, the automotive industry, medical fields, computer games, and film production” (Dawud, 2021).

It can therefore be said that artificial intelligence — beyond being that branch of computer science — is that electronic substitute that attempts to simulate the human mind in its tasks of thinking and adapting to different situations and solving problems, and that even seeks to surpass the human mind in doing so, in terms of speed, accuracy, quality, and reduced cost of performance. This calls to mind the words of the French philosopher Paul Valéry: “Every human being is in the process of turning into a machine—or rather, it is the machine that is being developed in order to turn into a human being” (Awad, 2022, p. 118).

This is a frightening thought, one reinforced by the words of the Hungarian philosopher and critic Georg Lukács, whose meaning has begun to come true in our own age, in which the human being has lost much of his worth. In pursuit of material gain in its various forms, he strives, in turn, to create machines equipped with programs that think and even display emotions like a human being. What a strange paradox!

2.2 Emergence and applications

The earliest intimations of artificial intelligence go back to ancient times, when the idea of mechanical men and creatures of extraordinary intelligence took hold; but its real beginning was in the 1950s, when Alan Turing studied the possibility of machines being able to think, in his research paper “Computing Machinery and Intelligence” (1950), in which Turing first coined the term “artificial intelligence” and presented it as a theoretical, philosophical concept. Between 1957 and 1993, advances in computing allowed computers to store more data and process it more quickly; during this period scientists developed machine-learning (ML) algorithms. During the 1980s, development was facilitated by the enhanced funding made available and by the expansion of the range of algorithmic tools used by AI scientists; David Rumelhart and John Hopfield published research on deep-learning techniques, showing that computers could learn from experience.

Between 1990 and the early 2000s, scientists achieved many of the fundamental goals of artificial intelligence, such as defeating the world chess champion. With more computing data available and greater processing power in the modern era compared with previous decades, AI research has now become more widespread and more accessible (AWS, 2021; Nasim, 2021, pp. 26–32).

Among the most recent innovations of artificial intelligence — which has come to be present in our daily lives to a remarkable degree — are language-teaching programs, of which Duolingo is perhaps the simplest example, as well as chatbots such as ChatGPT, which carries on conversations and produces responses just as a human would. Nor should we forget the use of artificial intelligence in the military domain, of which unmanned drones are perhaps the best evidence, matched on the other side by the production of what is known as the virtual shield against such aircraft; not to mention self-driving cars. In the medical field, we find an

increasing reliance on this form of intelligence, whether in diagnosis or in the manufacture of medicines and medical devices such as scanners for disease detection, and much more besides.

The growing reliance on artificial-intelligence products has, however, begun to raise concern — indeed alarm — among many specialists. Many have warned that intelligent chatbots may soon become more intelligent than human beings, and that they may rebel and slip out of human control, threatening humanity's very existence.

3. Mind Maps

3.1 Concept

Tony Buzan — the founder of the mind map — defined it as a technique built on a system that enables the individual to make use of mental skills, and on drawing; it is equipped with keys that can be used to advantage in every area of life, since it helps to improve performance. In his own words: “The mind map is the easiest way to put information into your mind and take information out of it; it is one of the creative, innovative ways of taking notes, one that maps out your thoughts completely” (Buzan, 2009, p. 13).

Accordingly, “the mind map is a graphic technique devised by the British researcher Tony Buzan in his book *Use Your Head*, and is used for taking notes, exchanging ideas, solving problems, and planning projects. It is used to clarify the links between numerous ideas or pieces of information, such that each idea or fact is written down and then linked, using lines or curves, to its main or secondary idea, forming a network of links and relationships” (Hathat, 2018).

As Buzan says, the mind map is like a road map: it offers a comprehensive view of a subject or a broad field, enables you to plan goals or identify options, and helps you determine your destination and where you previously stood. It also works to gather the largest possible amount of information in one place, in addition to encouraging problem-solving through creative means. Moreover, dealing with it — like a road map — is an enjoyable and entertaining experience, since reading it, recalling it and working with it allow you to organize facts in a manner similar to the way the mind itself works, which makes remembering and recalling matters at a later stage far easier than when using traditional teaching methods (Buzan, 2009, pp. 55–58).

The mind map is therefore considered one of the mechanisms — or strategies — of dynamic, active teaching, and is among the useful tools for strengthening memory, increasing concentration, and retrieving information while generating new and distinctive ideas. Mind maps are also known as concept maps, which help facilitate and simplify learning and make it possible to discover knowledge by the fastest and easiest routes, by drawing diagrams — or maps — that identify the main concepts and the ideas that branch out from them in a logical way that fixes them in the mind.

Mind maps are of great importance: they can be used in teaching as one of the pedagogical applications that take individual differences into account — for both learners and teachers —

and they encourage creativity, stimulate thinking skills, and motivate learners through the elements of excitement and enjoyment they add, as well as developing the ability to organize information, which helps raise the learner's academic level, not to mention their role in building learners' self-confidence through creativity and innovation. They are also flexible, and can be put to use across many subjects and disciplines (Abd al-Ra'uf, 2019, pp. 99–100).

From the foregoing it can be said that mind maps are effective in both teaching and learning alike: they help clarify and simplify what is learned by making use of the organizational diagrams they offer, identifying the main idea and the sub-ideas and how the latter connect to the topic in a logically and functionally coherent way, making it easier for the learner to understand, store, and retrieve the material when needed.

3.2 Programs, tools and applications for designing mind maps

Artificial intelligence offers a variety of programs, tools and applications for designing mind maps. Some are expensive, aimed primarily at companies and institutions, while others are reasonably priced and also offer free trial periods that can be put to good use. Among the best known are:

- GitMind (web tool)
- MindMeister
- Lucidchart
- MindOnMap
- FreeMind
- Miro
- Canva

4. Investing Artificial Intelligence in Drawing Mind Maps for Teaching Arabic

4.1 Characteristics of Arabic Sounds

After determining the topic — or main idea — for which a mind map was to be drawn, and submitting it to the Whimsical and ChatGPT programs, the following maps were obtained:



Figure 1. Mind map of the characteristics of Arabic sounds designed by Whimsical (recreated in English).

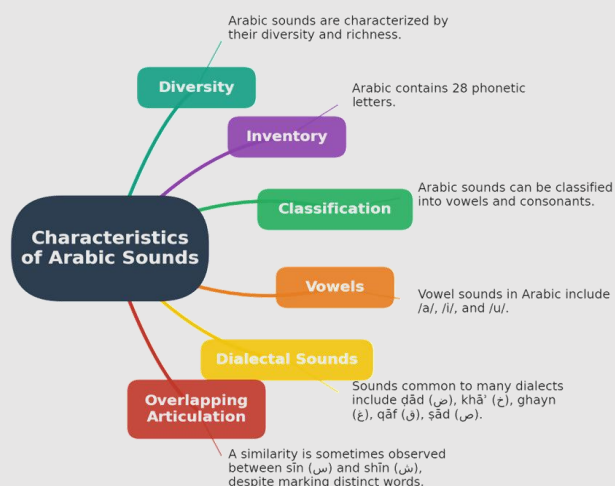


Figure 2. Another mind map of the characteristics of Arabic sounds proposed by the same program, Whimsical (recreated in English).



Figure 3. Mind map of the characteristics of Arabic sounds proposed by ChatGPT (recreated in English).

These were the results obtained when we relied on the capabilities of artificial intelligence to draw mind maps for the topic "characteristics of Arabic sounds": it did not succeed in doing so satisfactorily. By contrast, after drawing on the resources available for drafting while allowing the human mind to intervene in setting out the relevant information, branching it, and explaining it, we were able to obtain the following result:

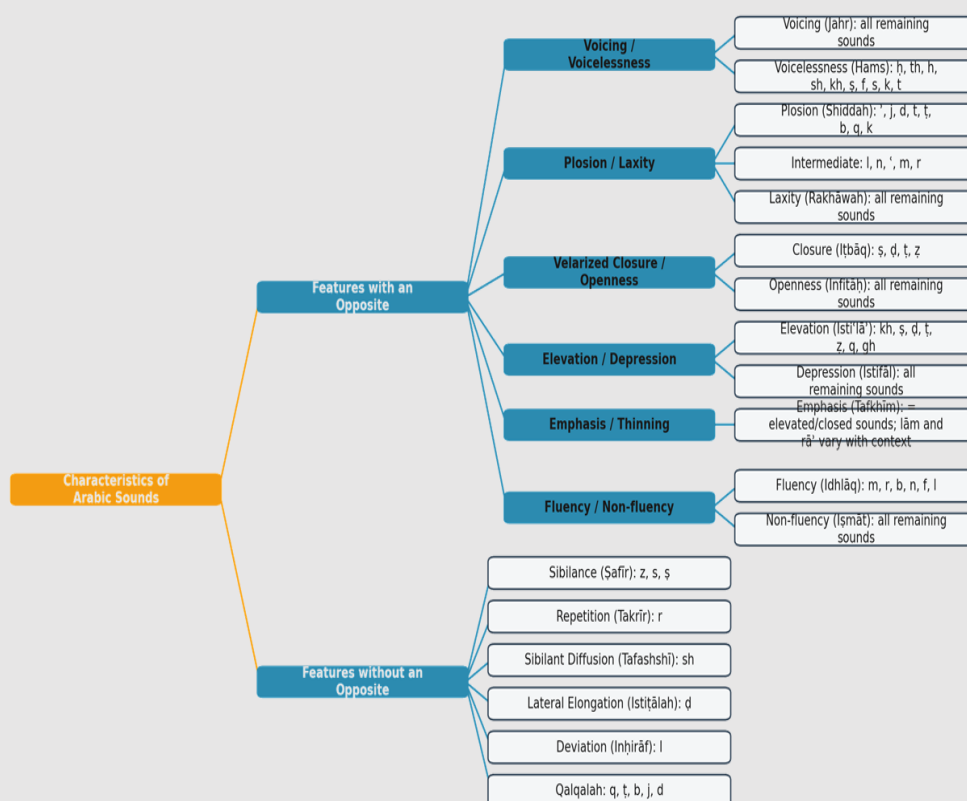


Figure 4. Mind map of the characteristics of Arabic sounds designed with the help of the mind-mapping program GitMind (recreated in English).

Note: the program is not designed specifically for Arabic; for this reason it was not possible to draw the map running from right to left. The same is true of the maps proposed by Whimsical.

4.2 Relative Pronouns

After determining the topic or main idea — again using the Whimsical and ChatGPT programs — we obtained the following maps:

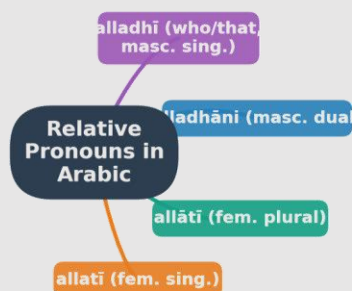


Figure 5. Mind map of Arabic relative pronouns proposed by Whimsical (recreated in English).

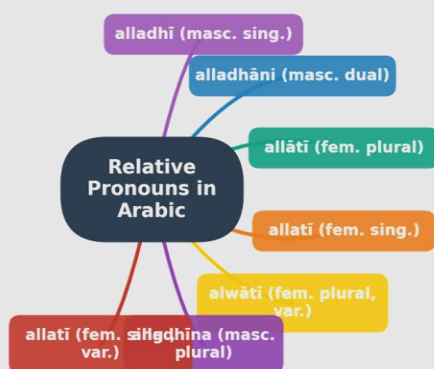


Figure 6. Another mind map of Arabic relative pronouns proposed by the same program, Whimsical (recreated in English).

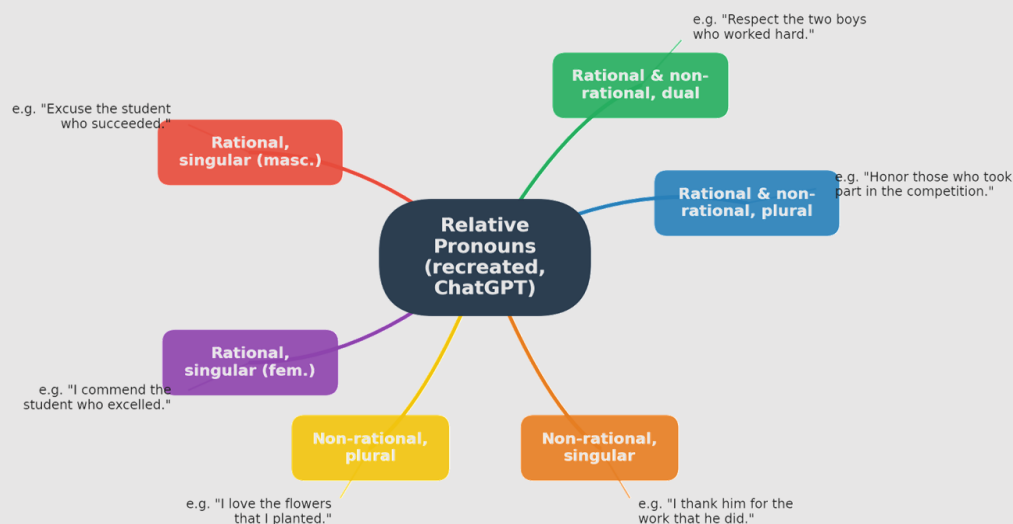


Figure 7. Mind map of relative pronouns proposed by ChatGPT (recreated in English).

These were the results obtained, and they revealed a clear knowledge gap in AI programs when it comes to producing educational mind maps, whether for the characteristics of sounds or for relative pronouns in Arabic — particularly the map produced by the disappointing ChatGPT, which had trouble not only at the level of the information itself but even at the level of language use, which points to a deficiency in its Arabic-language database.

By contrast, after drawing on the resources available for drafting while allowing the human mind to intervene in identifying the main idea and the various branches, together with an example for each idea, the following result was reached:

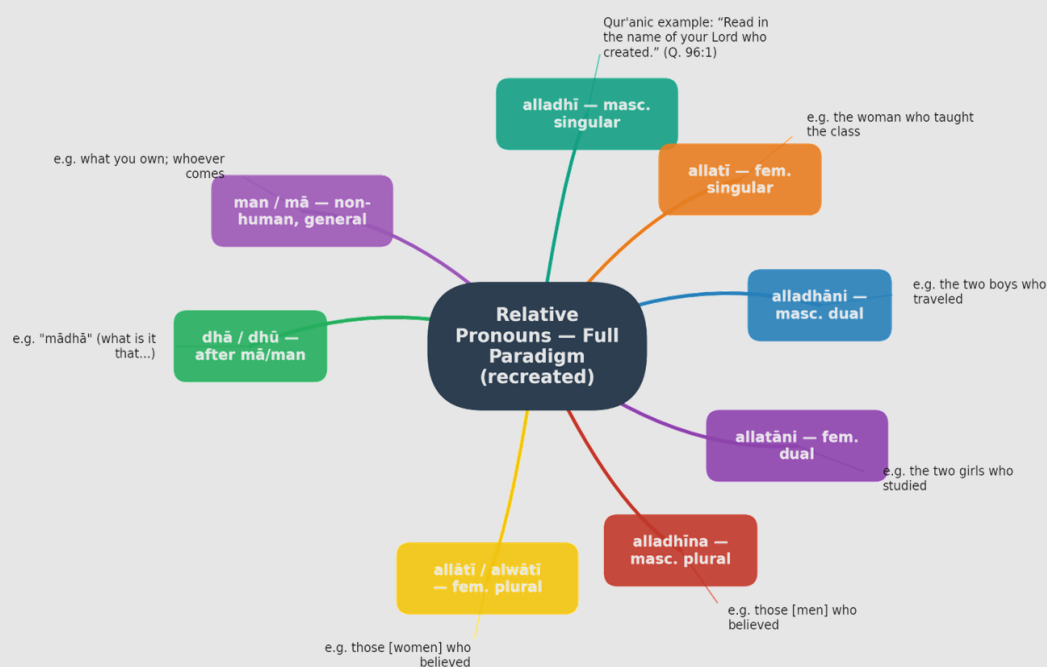


Figure 8. Mind map of Arabic relative pronouns, human-designed (recreated in English, after Ghofrane Hassan, n.d.).

5. Conclusion

After this research tour through the field of investing artificial intelligence in teaching Arabic by means of mind maps, a number of findings emerged, summarized as follows:

Education is a fundamental pillar for every nation; this is why educators and those concerned with pedagogy have worked hard to develop teaching methods and to make use of every possible instructional aid. Among these aids are mind maps, which, ever since they were drawn by hand with a pen, have now come to be designed using the latest artificial-intelligence applications.

Artificial intelligence saves human beings time, effort and cost, and ensures accuracy, quality and speed in performing various tasks. Even so, it still needs to be fed and supplied with a huge amount of data in order to improve its performance, particularly where the Arabic language is concerned.

As for investing artificial intelligence in teaching Arabic, and specifically in using it to design mind maps, it became clear that the programs and applications currently available are of

limited value in this domain: some offer suggestions for drawing maps that the human being must then coordinate, define the main concepts as distinct from the secondary ones, and so on — tasks that must ultimately be taken on by a human being. As for the programs that offer you a ready-designed map, what they provide suffers from a knowledge deficiency, owing to the lack of the data needed, especially where Arabic is concerned.

Artificial intelligence has become an inescapable reality; it is present in our lives in most of its aspects, and education is one of them — indeed the most important of them. Yet the Arab world in general is still not sufficiently prepared to invest artificial intelligence in education, whether at the level of teachers, learners, or equipment, despite the efforts made to keep pace with the rapid rate of technical development. To achieve this, work must be done to train teachers in the use of these methods, both for teachers and for learners alike, and to provide computers, display screens, a good internet connection, and everything related to this type of teaching.

Despite the various advantages of artificial intelligence, it cannot substitute for the teacher in the instructional situation, because education — beyond accuracy, speed and efficiency — requires emotion and conscience, and non-human entities cannot be said to possess either.

Artificial intelligence must be dealt with very cautiously, particularly where education is concerned, because it shapes generations and is the backbone of a nation; every society has its own particularities — doctrinal, social and cultural — that must be respected, and should not be left in the hands of a machine, or a technology, that could undermine them, and indeed threaten the very existence of the human being.

References

Books

- Abu Zayd Nawwari Saoudi. (2012). *Lectures in Applied Linguistics* (1st ed.). El Eulma, Algeria: Bayt al-Hikma.
- Ahmad, Muhammad Abd al-Qadir. (1999). *General Teaching Methods*. Cairo, Egypt: Dar Nahdat Misr.
- Ahmad Nasim, Mohamed. (2021). *The New Intelligence Revolution* (Vol. 1). Batna, Algeria: Dar Adlis for Publishing and Translation.
- Buzan, Tony. (2009). *How to Draw a Mind Map: The Super Thinking Tool That Will Change Your Life*. Riyadh, Saudi Arabia: Jarir Bookstore.
- Bonnet, Alain. (1991). *Artificial Intelligence: Its Reality and Its Future* (Ali Sabri Farghali, Trans.). Kuwait: World of Knowledge ('Alam al-Ma'rifa).
- Jaloub, Samir. (2016). *Teaching Aids*. Mecca, Saudi Arabia: Dar Khalid al-Lahyani for Publishing and Distribution.

Al-Darij, Muhammad. (1991). Analysis of the Educational Process — An Introduction to the Science of Teaching (2nd ed.). Casablanca, Morocco.

Abd al-Ra'uf, Tariq. (2019). Mind Maps and Learning Skills: Your Path to Building Creative Ideas (1st ed.). Cairo, Egypt: The Arab Group for Training and Publishing.

Fatim, Muhammad Lutfi, & Abu al-Azayim, Abd al-Mun'im. (1981). Contemporary Learning Theories (1st ed.). Cairo, Egypt: Maktabat al-Nahda al-Misriyya.

Mar'i, Tawfiq Ahmad, & al-Hilah, Muhammad Mahmud. (2002). General Teaching Methods (1st ed.). Amman, Jordan: Dar al-Maysara for Publishing, Distribution and Printing.

Articles

Awad, Sara Makram. (2022). The Legal Framework for the Ethics of Using Artificial Intelligence in Egypt, Jordan, and Saudi Arabia. Scientific Journal of Intellectual Property and Innovation Management, 10(19), p. 118.

Websites

Hathat, Shaher. (2018). What Are Mind Maps? Retrieved February 2023, from <https://mawdoo3.com/الذهنية-الخرائط-هي-ما/>

Ghofrane Hassan. (n.d.). Relative Pronouns. Retrieved February 2023, from <https://www.audiolaby.blog/2019/10/Mind-mappaing-and-how-to-do-it-perfectly.html>

Dawud, Muhammad. (2021). The Future of Artificial Intelligence and Its Impact on Society. Retrieved February 2023, from Al Ain University: <https://aau.ac.ae/ar/news/2021/the-future-of-artificial-intelligence-and-its-impact-on-society>

AWS Developers. (2021). What Is Artificial Intelligence (AI)? Retrieved February 2023, from AWS: <https://aws.amazon.com/ar/what-is/artificial-intelligence>

Staff, C. (2023, November 29). What Is Artificial Intelligence? Definition, Uses, and Types. Retrieved February 16, 2024, from Coursera: <https://www.coursera.org/articles/what-is-artificial-intelligence>