Multiple Intelligences (MI) Theory in Education:

A Critical Analysis of The Neuromyth

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Abstract

Over the last two decades, the number of teachers trying to apply MI theory has increased, even if it is considered a neuromyth. This critical literature review suggests stopping using neuromyths in literacy as long as it has been proven not to be a scientific theory and start using trustworthy lands just like neuroscience. Neuroscience is closer to the pedagogy arena because of its new instruments and concerns about the learning process, which can be useful in the literacies field.

Keywords: education, literacy, learning, multiple intelligences, neuromyths

Resumen

En las últimas dos décadas el número de profesores que intentan aplicar la teoría de las IM ha ido en aumento, incluso si esta es considerada un neuromito. Este estudio de tipo revisión crítica de la literatura sugiere el uso de neurociencia en lugar de neuromitos, en este caso, el neuromito de las inteligencias múltiples. Asimismo, expone algunos argumentos sobre el porqué es un neuromito. La neurociencia está cada vez más cerca del campo de la pedagogía por sus nuevos instrumentos y preocupaciones sobre el proceso de aprendizaje, que pueden ser de utilidad en el campo de la literacidad.

Palabras clave: educación, literacidad, aprendizaje, inteligencias múltiples, neuromitos

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Introduction

It is not uncommon to hear teachers talk about multiple intelligences. In 1983, Howard Gardner published his seminal work, *Frame of Mind*. Gardner (1983) claimed he would change the traditional concept of intelligence there. At the beginning of his theory, the psychologist talked about linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, and personal intelligence. However, by 1999, he had already added two more (and during an interview in 2016, he talked about adding some more). Nonetheless, the fact that it seems he uses ability as a synonym for intelligence, so he has to add new types each time, is not the only reason why many academics criticize his work.

Nobody can deny that the idea of everyone being an uncomprehended, misjudged genius is attractive. People want to hear that they are capable (and worse, studies have shown that the most ignorant people tend to overestimate their intelligence according to the BBC, [2013]). However, if teachers trust theories because they are enticing without thinking about their context or students, they do not deserve to be called pedagogues but salespeople. One of the main problems with this is that when the education system sees the student as a customer, methodological decisions are not taken because of their effectiveness, resulting in a substandard educational process (Bay & Daniel, 2001). Gardner (2011) admitted that his method does not judge intelligence scientifically but in an artistic way.

It could happen that inside an informal institution where they do not care about formation but about making money, it is okay to sell the idea of multiple intelligences. After all, they do not have a big responsibility toward human beings but only specific knowledge. Their duty as a company is to satisfy customers. However, inside formal education such as primary, secondary, high school, and higher education, teachers have a more complex responsibility: educating human beings, not customers. The student as a customer does not

consider the global process but only the moment, a short-term satisfaction (Bay & Daniel, 2001). Teachers must search for proven theories, not just flashy ones.

Now, Gardner does have arguments that are based on science. For example, he uses the brain's ability to change as an argument. He claims that we have specific brain zones for every single brain function, like the capacity to locate ourselves in space, or what he would call spatial intelligence (Gardner, 2011), proving that we have several kinds of intelligence. However, this statement is rather problematic for two reasons. On the one hand, this implies that intelligence is not something we are born with but something we acquire. On the other hand, having different brain zones for different cognitive functions would mean every zone would have a distinct intelligence. We would have to talk about at least four types of intelligence to encode what our eyes see (Bear et al., 2016). So, naturally, it would imply we have many kinds of intelligence derived from kinesthetic as we have many different parts of the brain in charge of moving in a certain way in every part of our body.

That said, when talking about literacies, it is better for the education process if teachers use trusted, proven theories (unless they are doing research, in which case the relationship with theory is shifting). If educators want to get into the brain business to improve their teaching methods, this text suggests replacing neuromyths with authentic neuroscience. For instance, Kuhl (2011) assures that safe functional brain measurements in the arena of language can document the neural signatures of learning at a remarkably early point in development and finds that these early measures predict performance in children's language and pre-reading abilities from two to five years. This way, neuroscience can help pedagogies achieve their objectives and contribute to the dignity of the teacher's labor by showing they are trustworthy through science instead of theories based on rumors and feelings. The purpose of this text is to convince teachers to use trustworthy theories instead of

unsubstantiated pseudo-theories. This thesis invites teachers to stop using neuromyths and start using science.

MI theory is a good thing to discuss in a school setting because it could affect how teachers teach or assess (Ferrero et. al, 2021; Kezar, 2001; Suárez et. al, 2010). If it is a scientific, well-founded theory, it could even change curricular guidance in general. But on the other hand, if it's not scientific, it's helpful for teachers to figure out if we can use some parts of Gardner's theory or if teachers should ignore it all. The importance of this is directly implied in students' learning. If the theory is true, it is necessary to perform a more personalized education, which is complex, especially when the average number of people per classroom, according to the OECD (2013), is more than 20.

Consequently, two questions drive the conversation in this thesis, (a) what are some valid critiques of MI theory in language education? (b) How could the intersection of neuroscience and literacy be a better way to teach language than MI? These questions are just the beginning of a conversation and a line of inquiry that must be further explored through the mixing of neuroscience and education (two subjects of interest for the author of this text), rather than definitive statements that will need more time and actual research.

Setting the Scene

A Brief Literature Review

Neuromyths are present in the education field even nowadays with all the information that is one click away. Hughes et al. (2020) claim neuromyths are misconceptions about learning generated by a misunderstanding, misreading, or misquoting scientific facts, as the Organization for Economic Co-operation and Development (OECD) defines them, and they can drive teachers to use ineffective and non-evidence-based teaching practices, which have "serious adverse effects on education systems."

Dekker and colleagues (2012) use the same definition as Hughes, the OECD one. Also, they explain that the influence of these myths in education is a problem because it wastes (not spend but wastes) "money, time, and effort which could be better spent on the development of evidence-based practices." Also, they spread rapidly among teachers, who will be most eager to use misunderstood brain-based ideas in the classroom. Their study points to MI theory as one of the most famous (and applied) neuromyths.

Key Terms for this Review

Education

All of this research is related to education. When talking about the brain in education, John Geake (2008) says: "Educational practices which claim to be concomitant with the workings of the brain should be so, at least to the extent that the scientific jury can ever be conclusive." That is why it is necessary to bring the MI discussion as long as it claims to be so.

Pedagogy

Teachers must not only teach but also learn. As Fawcett and Nicolson (2007) explain, "Pedagogy is the art and science of teaching and learning." If some teachers are using neuromyths to teach, they should learn actual science and bring it to the classroom.

Literacy

Mackey (2002) defines literacy as

> Primarily something people do; it is an activity, located in the space between thought and text. Literacy does not just reside in people's heads as a set of skills to be learned, and it does not just reside on paper, captured as texts to be analysed. Like all human activity, literacy is essentially social, and it is located in the interaction between people.

> As the author claims, the literacy process in school is less problematic if it uses

pedagogical methods.

Learning

> There are many complicated words in the educational field, and learning is one of those. About the concept, Houwer and colleagues (2013) suggest doing "An explanatory mental mechanism and invent a new term to refer to learning as a to-be-explained functional effect." The word learning could be considered an abstract one. It makes it difficult to define what it is exactly, like with an object as a car or a chair. However, it is possible to see it as a process. There are certain methods to make this process more effective. Teachers who use non-trustable "theories" to teach will obstruct learning.

Teaching

> Studying the brain can be helpful for the teaching process. As Owens and Tanner (2017) claim,

> Because teaching and learning arise from properties of the human brain, the ability of a teaching technique to harness the processes in a student's brain that support the formation and retrieval of long-term memories will help determine that technique's effectiveness in promoting that student's learning.

Due to that, it is relevant to look up better techniques to improve the student's learning. That is the reason why using theories related to neuroscience could be helpful.

Multiple Intelligences (MI)

MI theory has been widely criticized for being considered a neuromyth. However, a broad number of teachers still trust it,

> Howard Gardner's Multiple Intelligences (MI) theory has been widely accepted in the field of education for the past two decades. Most educators have been subjugated to the MI theory and to the many issues that its implementation in the classroom brings" (Peariso, 2008).

As long as it brings issues to the classroom, it is a matter to analyze the theory and search for a solution.

Neuroscience

There has been an increased push to use neuroscience to analyze and improve learning. Clement and Lovat (2012) talk about it when they explain that the growing knowledge of the human brain generated by the proliferation of new brain imaging technology in recent years has given rise to questions about the potential for this new knowledge of neural processing to translate it into "usable knowledge" that teachers can use in the classroom. The application of neuroscience findings to education is controversial. Some people question its relevance to educational practice. Simplistic generalizations about the application of neuroscience in education are considered neuromyths and are at best considered irrelevant or counterproductive to good educational practice. There are some risks to using it as how jazzy neuromyths could sound. However, when teachers take care of falling for them, the use of neuroscience in pedagogy results in engrossment. As Ching et al. (2020) claim,

As the connection between neuroscience and education becomes more evident, an interdisciplinary field commonly referred to as "educational neuroscience" has emerged. Although there have been scepticisms regarding the implications, usually the direct implications or applications of neuroscience for education [8,10,11,57,85], it is generally accepted that neuroscience can make wideranging contributions to education.

As a study made by Moirano and colleagues (2019) showed, knowledge of diversity and interdisciplinary collaboration, training, exercises, and experiences are important interactions in education. Neuroscience brings one of many opportunities teachers can take to make their classroom and interdisciplinarity a place.

Neuromyth

Not every "information" about the brain and mind is scientifically proven. Sometimes there are mistaken ideas, as the Centre for Educational Neuroscience (2023) explains, "Teachers and parents have a great enthusiasm for the brain sciences and the light they can shed on children's and adults' learning in educational environments. We share that enthusiasm at the CEN."

However, we also believe that sometimes this enthusiasm can lead to educators too readily accepting teaching practices, ideas, or techniques that do not actually have a scientific basis in neuroscience – or which reflect some basis in neuroscience but have not been rigorously tested within an educational context. This phenomenon has been labelled the spread of 'neuromyths' – mistaken ideas about the brain – and has been the topic of neuroscience researchers' discussion.

MI theory is considered a neuromyth, so the term is directly related to this article.

Methodology

This study uses references supporting different points to build the most appropriate conclusions. According to that, it is qualitative research; as Law et al. (1998) explain, qualitative research "is oriented towards theory construction, and the reasoning behind data analysis is inductive; i.e., the findings emerge from the data." Also, as long as it uses existing research to answer existing questions, it is a critical literature review (Mora, 2020).

When doing a good critical literature review, the study helps to advance the understanding of what is already known (Jesson & Lacey, 2006; Saunders & Rojon, 2011). That is why it uses at least fifty references. As is explained in the following pages, the new technologies in the neuroscience field have shown some relevant information for teachers and pedagogues. However, not many educators know the area. Numerous studies show that there is a wide number of teachers who believe in neuromyths. For instance, a study by Satyavi and Bissessar (2021) showed that the teachers they based their study on could not recognize at least half of the neuromyths they used in their surveys. Now, talking about multiple intelligences, several studies already show it as a neuromyth. Nevertheless, teachers still believe in it as a neuroscientific fact (Torrijos, 2021). Based on that, and due to the problem it represents, I consider it necessary to get deeper into the issue and use different existing studies to draw my conclusions.

The critical literature review can have different objectives. One of those, as Jesson and Lacey (2006) explain, is doing a systematic review to inform evidence-based policy or practice, as in the case of this article. This text is trying to put an eye on the Multiple Intelligences of Gardner's theory because of the number of teachers believing in it. Nonetheless, doing neuroscience research requires many monetary and educational resources (Soe et. al, 2012) which I do not have. Additionally, analyzing brain mechanisms by myself

would take a couple of years, and it would be only one part of this article. As a solution to this problem, the critical literature review allows using existing proofs.

Calle (2016) explained that one of the most important things while writing a scientific article is finding relevant information from specialized and trustable resources. To find the articles for this review I took a two-level approach. For the first level (recognizing major trends in the fields), I explored web-based article search engines and websites such as Google Scholar and ResearchGate, as they offered direct access to journals such as Mind, Brain, and Education and to printouts of journal articles from different scholars I also recognized through Google Scholar. For the second level (locating specialized articles) I relied on the existing databases at my two universities, including ScienceDirect, EBSCO, and JSTOR. The searches on these databases helped me find more information about the topic from educational and medical perspectives. As an additional resource for both levels, I also used Frontiers to find information, as having free access to different texts helped me complete major sections of this article.

Findings

As this is a critical literature review, it intends to treat the literature as data, so it uses a variety of texts to answer the research questions. The research questions in this text inquire about the valid critiques of MI theory in language education and how to intersect neuroscience and literacy as a more feasible alternative to teaching language than MI. This question stems from the worries about the number of teachers who believe in this neuromyth. For instance, an Australian study by Hughes and colleagues (2020) showed that 79% of the studied teachers believed in the MI theory, which is the third most famous neuromyth among teachers. This situation is problematic because, as Grospietsch and Lins (2021) explain, it could lead educators to use ineffective learning strategies for their students, wasting the education system's money, time, and effort instead of spending it on more effective theories and methods.

Even with all the debate around it, some teachers support the MI theory and even use it in the classroom. For instance, Shearer and Karanian (2017) uphold Gardner's theory based on "a detailed examination of three levels of neural analysis." First, they argue that there is a correlation between eight large neural regions and that none of the "intelligences" uses the same three main subregions. Their second argument to support MI theory is that we use particular brain regions for each of the "intelligences" proposed by Gardner. Their "third-level examination of specific structures within sub-regions" talks about different structure configurations and gives as an instance the "visual-spatial intelligence", which they claim is associated with the parietal cortex (primary level) and intraparietal and superior parietal lobule (sub-regions) and also the precuneus (third level). The most common defense is that we use different parts of our brain for actions related to each of the eight "intelligences" Gardner described.

However, intelligence and brain are not as simple as dividing the first into sections for each ability. Brain functions result from complex mechanisms that work mostly like a chain, all connected by axons and dendrites between others (Zinsmaier et. al, 2008). They are not as easy as one part in charge of one function as this argument wants to make it appear. For instance, it would not be possible to talk about a specific part of the brain for "visual intelligence" because it consists of much more than one single part (Kels, et. al, 2015), and it is not even a hierarchy. The brain is not as "tidy" as that. (Hegdé & Felleman, 2007). The images captured by the eye reach the retina through the optic pathways to the primary visual area (also known as V1), located in the occipital region of the brain. Then, it divides into two different routes: the ventral and the dorsal. The ventral route goes to the parietal lobe, and the dorsal one to the temporal lobe. Here we already have three distinct (and distant) parts of the brain, and, if it were little, the visuospatial intelligence talks about differentiating shapes and administrating space at the same time, while those are different brain processes, the first one made in the ventral root and the second one in the dorsal one (Neira et al., 2022).

The ventral route helps with the object and how we perceive its shape and color. The dorsal route, instead, is the one in charge of processing the location in space, the depth, and its movement (Conway, 2013). Object recognition involves the left mid-inferior temporal lobe, the right anterior temporal lobe, and the left cerebellum (Humphreys et. al, 1997). Keeping that in mind, if every single function of the brain is going to be considered a different intelligence, it would be necessary to make up two different "intelligences" only for one part of the vision process, and it is still missing the rest. That said, it is not practical to create a thousand "intelligences" to separate the different functions of the brain.

Even if a teacher decides to believe in the multiple intelligences theory, it does not help its use in the classroom because it is not the same as learning styles. The most logical thing to think about when one hears about different intelligences is that teachers can use

different ways of teaching, so everyone understands better. Due to this, many people link the MI theory with the Learning Styles theory. The Learning Styles theory proposes that individuals have different ways of learning, so they must be instructed in their favorite mode of instruction so they will understand better, and in the last decades, it has become more famous each time (Pashler, et al., 2018). About this, Gardner itself disagrees. As Westby (2019) mentions,

> Learning different types of content requires different types of intelligences. Multiple intelligences are not learning styles. Gardner maintained that there's no clear evidence that teaching to a student's learning style produces better outcomes. In fact, according to Gardner, "insistence on learning styles may be unhelpful, at best, and ill-conceived at worst." Strength or weakness in one kind of intelligence does not predict strength or weakness in other intelligences. All of us exhibit variations among the different intelligences described by Gardner. Some persons are better at math, others at music, art, or writing. This does not mean that one should employ a mathematical approach to teach music. (p. 2)

If you are supposed to be a genius with the movements of your body, it does not mean that you can learn math better if you do it while dancing. It only means you are good at moving your body.

Even if teachers decide to ignore that they are using two different theories (that sound the same but are so different that Gardner says LS could even make the learning process more difficult), none of them has proven true. Some "MI" theory studies are already taken to the classroom (which do not use MI but LS). One example is the one performed by Derakhshan and Faribi (2015). They claim to report the effects of multiple intelligences on learning and teaching English, and their study concluded:

no single method of teaching writing can best suit all types of learners since writing is

shown to be differentially related to different types of intelligence and since human

beings enjoy different levels of the various types of intelligence, the logical result to

be drawn is that learners will experience differential success no matter how they are

taught writing" but that it can motivate students. (p. 70)

However, they also concluded that it is possible to motivate English learners by using

strategies oriented to the different intelligences proposed by Gardner. But despite that, the

study conclusion is clear when it says no correlation is found between MI and successful

teaching.

As one can see (and Gardner admits), the arguments to support MI theory are more of

a creative process than actual science; it does not even have a real usage for teaching

techniques because MI is not the same as Learning Styles, and it is not proven to work

(Cuevas, 2015). However, if teachers still want to use brain knowledge in their classrooms,

they can get into neuroscience. Thanks to new technologies, neuroscientists have real-time

representations of the functioning of the living human brain, which have yielded interesting

scientific results to help understand a few more about brain mechanisms useful in education

(Goswami, 2009). This thing, the basic neuroscience knowledge, and insights, is called

neuroscientific literacy (Jolles & Jolles, 2021). If future research takes an interdisciplinary

approach to problems in the educational field, teachers could find even better techniques.

However, the situation makes it indispensable to mention the necessity to be careful

while touching such a complex field as neuroscience. As mentioned before, teachers do not

have extensive or specialized knowledge in the neuroscientific field (Ching et al., 2020). That

is one of the reasons why neuromyths exist: people try to easily understand complex topics,

which leads to misunderstandings (Tokuhama-Espinosa, 2018). For instance, various

neuromyths exist because they are partially true and transmit sensationalist ideas. If a teacher

uses neuroscience in his classroom, they must actualize the information constantly. As an example of this confusion, as Tokugama-Espinosa (2018) mentions, some myths were "true" at a specific moment because they used old tools during the experimentation but not with the new technologies. But those are not the only misunderstandings that can happen.

There is a famous belief that the environments of rich stimuli improve children's brains. The Organization for Economic Cooperation and Development (2002) explains that the myth could have originated because of an experiment with rodents. The examination performed by six scientists proved that rodents living in enriched spaces could solve problems easier and even have a higher brain density than the rats who lived in a non-enriched one. However, humans are not rats, so it is impossible to affirm that if something works in a rat's brain, it also works in a human brain, especially when the stimulus is so specific. It would imply that children can solve complex labyrinths if you put cheese in their exit. The rich environment could represent different things for the rats, and it is not feasible to be sure if it also works with humans unless the experiment is tested with humans.

Notwithstanding, the risk of believing in neuromyths is lower if the educators who want to use neuroscience knowledge are informed. In the same study that showed the prevalence of neuromyths mentioned before, Bissessar and Joussef (2021) found that when teachers receive specific in-service training related to educational neuroscience, the currency of neuromyths is lower. Educators could attempt to use neuroscientific knowledge in their classrooms (Ansari & Coch, 2006). They only need to consider that they must get informed by trustable resources, not believing in something they heard from someone. Also, they must keep actualized. The scientific field is constantly changing, and teachers must comprehend that; as well as they do not continue believing that locking kids into cages when they do not obey during class is a good thing, the other scientific camps are also modifying their knowledge daily.

Conclusions

This article used a critical literature review approach to solve some questions and create valid critiques of the MI theory. At the beginning of the research, I searched for information that could help answer the question about using multiple intelligences in the classroom. However, the more I investigated it, the more I realized it was a non-trustable theory. The study about using multiple intelligences theory in the classroom became an article about questioning the theory.

As seen during the last paragraphs, the Multiple Intelligences theory by Gardner has no scientific (especially neuroscientific) support but is more about beautiful words. The arguments to support the theory are not enough, so it is considered a neuromyth. Neuromyths can represent a big problem in the classrooms because they are wasting time and resources that could be spent in trustable theories. However, that is not the only problem when discussing the Multiple Intelligences Theory due to one of its actual enemies: The learning styles theory.

Learning styles theory is not related to the MI theory. Gardner itself is against it. this "theory" is getting each time more in the classrooms, and some teachers use it thinking it is about MI theory. MI theory only claims different intelligences because the brain uses different zones for different actions. LS theory, on the other hand, maintains the idea of using different ways of teaching depending on student preferences. They are not the same.

The use of neuroscience in schools is problematic because it could lead to neuromyths because of the lack of trustable information and the superficial approach. However, if teachers want to use neuroscientific knowledge in their classrooms, they must only be informed by trustworthy, constantly up-to-date sources.

In conclusion, while multiple intelligences may be attractive, teachers should be careful about relying on theories that lack scientific evidence. The use of MI theory in

education is considered a neuromyth and it is better if it is replaced with more trustworthy and evidence-based theories, like Neuroscience. Therefore, teachers must use proven theories to achieve their objectives and not waste resources and time. The intersection of neuroscience and literacy may be a better way to teach language than MI theory, and it is an area that deserves further exploration.

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