

# A Review of Semantic Application of MI Theory and Effects for Teacher Training

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**Abstract** – The notion of “multiple intelligences” (MI) was established by Howard Gardner, a psychologist from the United States, during the latter part of the 1970s and the early part of the 1980s. Gardner introduced the concept of MI in his 1983 publication titled *Frames of Mind: The Theory of Multiple Intelligences*, positing that individuals possess unique cognitive abilities across eight discrete domains. As per the theory, there exist nine discrete categories of intelligence, such as logical-mathematical, visual-spatial, musical-rhythmic, verbal-linguistic, bodily-kinesthetic, intrapersonal, interpersonal, existential, and naturalistic. Individuals construct their distinct cognitive frameworks by engaging in activities that are highly valued within their respective cultural contexts. The present article furnishes a comprehensive outline of the rationales and plausible scenarios for deliberating MI theory with pre-service educators during their teacher training. This study examines the significance of Universal Design for Learning (UDL) and comparable models in the context of teacher training, taking into account the distinctions between the semantic theoretical foundations of intelligence in Multiple Intelligences (MI) theory and learning styles theory.

**Keywords** – Multiple Intelligences Theory, Linguistic Intelligence, Spatial Intelligence, Logical-Mathematical Intelligence, Musical Intelligence, Naturalistic Intelligence, Bodily-Kinesthetic Intelligence, Intrapersonal Intelligence, Interpersonal Intelligence.

## I. INTRODUCTION

According to the theory proposed by Howard Gardner, a renowned psychologist, during the 1970s and 1980s, individuals possess a minimum of eight unique types of intelligence. This theory is commonly referred to as the hypothesis of multiple intelligences. Individuals utilize these cognitive abilities, both independently and collaboratively, to create artifacts and tackle significant concerns that hold relevance to the societies they inhabit. The eight intelligences that are widely recognized are mathematical-logical intelligence, linguistic intelligence, musical intelligence, spatial intelligence, kinesthetic intelligence, social intelligence, emotional intelligence, and naturalistic intelligence. According to Pless, Chakrabarti, Rammohan, and Luger [1], the combination of language and logic can be conceptualized as "academic" or "scholarly intelligence," as these are the only two types of intelligence that are currently highly valued and assessed in modern non-religious educational establishments. The ideology of Multiple Intelligence (MI), also identified as MI theory, deviates from the conventional notion of intelligence that emerged in the early 1900s, is evident in contemporary IQ assessments, and was extensively researched by Han et al. [2] with a cognitive focus.

The precursor to modern intelligence tests was formulated during the early 1900s with the purpose of identifying French schoolchildren who required additional educational support [3]. The genesis of Binet's scale and the corresponding research conducted by Stevens and Bernier [4], on the concept of 'g' were the main driving forces behind the notion that a solitary, inherent ability to solve problems underlies all intellectual pursuits. Salmon et al. [5] postulation of a general intelligence factor, commonly referred to as 'g', serves as the fundamental basis for over 70 distinct intelligence quotients (IQ) assessments, and remains the prevailing paradigm in the realm of scholarly psychology. Conversely, the Multiple Intelligences theory posits that people demonstrating exceptional abilities in a single intelligence domain are not essentially guaranteed to exhibit comparable proficiency in other domains. An individual may possess a considerable degree of spatial intelligence while exhibiting a moderate or deficient level of interpersonal intelligence. The main difference between Multiple Intelligences (MI) theory and the dominant notion of intelligence in Western psychology and popular culture is the notion of intelligence as a multifaceted construct rather than a singular entity.

The second significant distinction pertains to the origin of intellect. Although certain contemporary scholars have demonstrated that early life experiences could potentially impact an individual's IQ, proponents of the notion of general

intelligence tend to consider the aspect of intelligence as an innate characteristic that is predetermined at birth. The MI theory posits that intelligence is a composite of inherent potentials and acquired competencies that can be molded through exposure to significant environments. Individuals may possess innate bodily-kinesthetic intellectual potential, which may facilitate the acquisition of complex dance techniques necessary for a ballet recital. Achieving an equivalent level of proficiency in ballet would require a significant investment of time and effort in studying and practicing for another individual. Both individuals possess the capacity to excel as proficient specialists in a domain that necessitates the utilization of their intelligence that is bodily-kinesthetic. However, the course they undertake to achieve this outcome could differ both in the basis of quantity, pertaining to the pace of progress, and quality, pertaining to the approach employed.

The theory of multiple intelligences does not exclusively present itself as the sole alternative to Mahmoud and Alaraj's [6] perspective on general intelligence. Additionally, there exist other theories that also conceptualize intelligence as a compilation of discrete abilities. Numerous scholars, including Alawieh et al. [7], posit that the amalgamation of abstract intelligence, mechanical intelligence, and social intelligence constitutes the fundamental nature of intelligence. The proposed model of intelligence posited by the authors involves a categorization of IQ into seven fundamental abilities. The author expounded on a comprehensive set of 150 unique forms of intelligence, which were classified into four distinct categories of content, six product categories, and five operational categories. Barberis Canonico, McNeese, and Duncan's [8] triangular intelligence theory acknowledges three distinct forms of intelligence: creative intelligence, practical intelligence, and analytic intelligence. The authors have delineated several cognitive abilities that facilitate the acquisition of knowledge and the exploration of conceptual associations.

Arguably, the most prominent among these pluralistic concepts is Gardner's MI theory. Gardner's comprehensive utilization of corroborating evidence and its broad acceptance within the academic community are significant contributors to its widespread acknowledgement. The concept of Multiple Intelligences (MI) has gained widespread acceptance among numerous educational institutions worldwide, with a plethora of publications produced in various languages emphasizing its significance for both classroom educators and educational establishments. A "science experience park" spanning 10 acres was established in Sonderberg, Denmark in 2005. The park featured over 50 interactive displays aimed at facilitating visitors' comprehension of their individual intelligence profile.

The subsequent sections will expound upon the fundamental concepts underpinning this all-encompassing theory, as well as certain modifications that have been implemented within the past twenty-five years. The sections have been organized as follows: Section II provides the rationale of the paper, while Section III provides a critical review of the previous literatures. Section IV discusses the integration of the learning styles theory concepts across language contexts. In Section V, a wide discussion on the rationale of the paper is provided. Finally, Section VI draws final remarks to the research.

## II. RATIONALE

The hypothesis of multiple intelligences (MI), which was formulated by Howard Gardner, has exerted a substantial influence on educational practices and policies spanning from early childhood education to secondary education. The current trend in education has been influenced by both professional development opportunities for practicing teachers and teacher education programs for individuals seeking to enter the field. Gardner's postulation, which was originally comprised of seven intelligences but subsequently broadened to eight, has exerted a substantial influence on educators worldwide. The impact of MI theory has prompted ongoing discourse among educational psychologists regarding its efficacy. While the viewpoints of educational psychologists and teachers regarding MI theory have been extensively explored, the perspectives of teacher educators who may solely instruct pre-service teachers in educational psychology have not been given equal consideration. The existing literature on educating preservice teachers about Multiple Intelligences (MI) theory is insufficient in comparison to the available resources on Universal Design for Learning (UDL) and Understanding by Design (UbD). This study investigates the controversy surrounding the effectiveness and legitimacy of MI theory. Additionally, we propose suggestions for the presentation and discussion of this subject matter in an educational psychology survey course designed for aspiring educators.

The majority of prospective educators hold a favorable perception of Gardner's Multiple Intelligences theory. Despite the longstanding debates among educational psychologists regarding the practicality and legitimacy of the theoretical framework, it remains extensively employed. The lack of statistical validity of MI theory has been the basis of critics by Maftoon and Sarem [9]. This critique has been reinforced by a recent study conducted by Rousseau [10] who examined the self-perception of MI theory among English as a second language (ESL) teachers and the utilization of the integrated MI. The study revealed either opacity or not relevant correlations between instructional strategies and the MI theory. The obtained outcomes prompt the inquiry of "Why?" in an academic context. What are the primary factors that contribute to the positive perception of MI theory among prospective educators? This investigation delves into the aforementioned concerns through a semantic lens.

The formation of worldviews during teacher preparation may offer potential insights into the ways in which prospective educators conceptualize MI theory. The aforementioned phenomenon could potentially materialize as a deficiency in the capacity to conduct a thorough and meticulous assessment of the extent to which concepts such as Multiple Intelligences (MI) theory are substantiated by empirical evidence within the field of psychology, notwithstanding the reception of purportedly favorable outcomes through the implementation of MI theory in practical settings. The MI theory receives qualitative support from studies conducted in the field of educational psychology, although the technical

statistical validity aspects are not fully corroborated. Although there are technical distinctions between these concepts in the field of psychology, particularly with regards to the term "intelligence" in the setting of Multiple Intelligence (MI) theory, they may become conflated whenever pre-service educators encounter them during field placement. This is often due to an unquestioning assumption that links differentiation and learning styles to preferences, based on their perceived popularity. The second argument corroborates the first one as anecdotal experience has a tendency to influence the perception of pre-service teachers regarding the efficiency of learning styles, including their related, particularly Multiple Intelligence theory.

### III. LITERATURE REVIEW

More than a century, a consensus has been reached among the majority of psychologists regarding a singular definition of intelligence. Professionals in the field of measurement possess the ability to assess an individual's intelligence at an early stage of life, utilizing conventional paper-and-pencil techniques. In the future, it may be possible to determine intelligence by analyzing brain activity or scrutinizing an individual's genome. It is widely acknowledged that IQ is heavily influenced by genetic factors and is a relatively stable trait that is resistant to change. In recent times, there has been an increase in dissent towards this widely held notion.

Nie, Cao, Wang, Lin, and Pan [11] raise a query regarding the meaningfulness of discussing a singular entity termed "intelligence" and the accuracy of metrics employed to ascertain the heritability of a trait, given that humans are not produced and propagated under regulated conditions, unlike plants and animals. As a research psychologist with specialized training, my professional background working with both typically developing and gifted children, as well as individuals who have experienced brain injury, has prompted me to challenge conventional assumptions. It is noteworthy that expertise in a particular domain does not necessarily translate to expertise in another. The correlation between an individual's aptitude or constraints in a particular domain and their proficiency in tasks such as storytelling, mathematical problem-solving, exploration of unfamiliar landscapes, analysis of the variations of a fugal theme, or comprehension of the intentions of others cannot be reliably anticipated. The postulation of the "theory of multiple intelligences" (MI theory) is grounded on this intuition.

Despite the fact that numerous scholars have experienced a comparable intuition, they have frequently endeavored to substantiate it by utilizing information obtained from conventional written assessments evaluating these proficiencies. When confronted with a scientific puzzle, I adopt an unconventional approach. In the author's perspective, intelligences refer to inherent abilities possessed by organisms to apply acquired knowledge in specific manners, resulting in the provision of solutions to problems or commodities that hold significant value in one or multiple societies. The identification of exceptional groups that exhibit remarkable strengths or weaknesses within a given domain, such as prodigies or savants, and the utilization of symbolic systems, such as maps or dance notation, to represent distinct types of information, are among the eight criteria that are scrutinized to ascertain the presence of potential intelligence.

This text examines two criteria with a physiological focus, accompanied by corresponding commentary. One of the factors to consider is the existence of a distinct evolutionary lineage. The likelihood of the existence of intelligence could be higher if its evolutionary origins can be traced to shared abilities with other species, such as bird vocalization or primate social organization. Although other animals may possess independent skills, humans tend to exhibit a complex interdependence among various abilities. It is plausible that diverse manifestations of musical intelligence may exist among various animal species; however, humans may possess a convergence of such forms. In his book titled "The Prehistory of the Mind," Stephen Mithen expounds on the plausible progression of multiple intelligences [12].

Another critical aspect to consider is the possibility of isolation resulting from brain damage. Historically, scholars held the belief that all regions of the brain possessed identical capacities. However, their current understanding differs from their previous belief. While it is advisable to steer clear of oversimplified phrenology, it is acceptable to designate the temporal and the middle frontal parts of the left hemisphere as language domains, and posterior parts of the right hemisphere as spatial domains (for right-handed individuals). Demonstration of a causal relationship between localized brain regions and a particular cognitive function constitutes compelling proof of discrete intelligence. According to these types of criteria, 7 discrete categories of cognitive abilities were initially identified. A vocation that necessitates such a degree of cognitive ability serves as an exemplar of excellence.

The musician excel in musical intelligence, poet excels in linguistic intelligence, and the marketer in social intelligence. There exist two plausible extensions of this cognitive framework for conceptualizing intelligence. Initially, it can be posited that all individuals possess a range of intelligences, thereby signifying the inherent nature of human beings with respect to their cognitive abilities. There exists a possibility that rats exhibit a higher degree of spatial intelligence in comparison to computers' logical-mathematical intelligence. However, it is noteworthy that neither of these entities possesses the ability to demonstrate emotional intelligence. Secondly, due to the distinct life experiences that individuals possess, it is evident that no two individuals, including twins, exhibit an identical assemblage of intelligences.

The scientific literature that I have reviewed subsequent to the book of *Frames of Mind* in 1983 [13] provides robust validation for the methodology employed and the intelligences identified in my work. Based on the newly acquired data, it was possible to ascertain the presence of a naturalist intelligence as the eighth and potentially an existential intelligence as the ninth. The potential indications of a correlation between musical and spatial processing warrant a reconsideration of the differentiation between these two forms of intelligence. Recent advancements in *in vivo* tools for studying the human brain have enabled a more precise characterization of abilities.

Finally, research on the human brain offers two essential revisions to my initial hypothesis. One notable observation is that individual's exhibit a greater degree of uniqueness than my prior assumptions had led me to believe. Additionally, it appears that nearly all talents beyond rudimentary abilities require the involvement of multiple regions within the brain. In the event that I were to engage in a rewriting of *Frames of Mind*, my emphasis would be directed towards the identification of instances wherein various forms of intelligence are correlated with the stimulation of analogous regions of the brain in a substantial cohort of individuals.

Gardner [14] has demonstrated favorable outcomes that partially support the Multiple Intelligences (MI) theory, albeit with certain limitations. Critiques of MI theory primarily center on the practical application of the term "intelligences" and the assessment of its validity in connecting intelligence to learning to pedagogy. In this regard, research has revealed no association between MI theory and its educational approaches. While certain studies have provided backing for theories regarding learning styles, Pacheco Rios [15] contend that this may be attributed to methodological ambiguity. The issue appears to originate from the manner in which MI theory delineates "intelligences" as a noun. The authors have examined the contextual interpretations of statistical information analysis integrated in-service or pre-service teachers to showcase the qualitative efficacy of MI theory in the interdisciplinary curriculum spanning from elementary to secondary school mathematics and science. The aforementioned researchers offer additional substantiation for the practicality of Multiple Intelligences theory within educational settings.

The enduring appeal of MI theory among educators is demonstrated by Rizqiningsih and Hadi [16], as it fosters reflection and experimentation with strategies for differentiating teaching, while also establishing connections to theories of learning styles. The multiple intelligences theory and the learning styles theory are separate concepts, but they are interconnected in that the former serves as a theoretical basis for the practical implementation of the latter. While both theories suggest that conventional notions of intelligence hinder our understanding of human diversity, the learning styles theory is apprehensive with alterations in the process of learning, while MI theory is apprehensive with the substance and outcomes of learning. Thus far, there has been limited convergence between the two aforementioned theories.

The enduring prevalence of MI theory in the public discourse underscores the significance of providing preservice teachers with an overview of the theory within the framework of other empirically-supported models during their educational psychology coursework. The utilization of evidence-based frameworks in education encompasses various approaches, such as Universal Design for Learning (UDL) and Understanding by Design (UbD).

Psychology is commonly regarded as a beneficial profession owing to its extensive utilization. The genesis of teacher training can be traced back to the field of psychological sciences. The evaluation of the effectiveness of teaching techniques holds significant importance in the psychology domain, which is a social science. Teaching is a profession that requires a significant degree of assistance. Nonetheless, it is equally important to consider the intuition of the teacher, which is cognizant by their classroom experiences and subjective assessments of the effect of a lesson on student learning, both historically and contemporarily. Despite the accuracy of psychological theories expounded in [17], the practical application of these theories in the classroom setting may present a contrasting reality.

Consequently, a correlation exists between the field of history and the field of psychology, with personal accounts often being incorporated into both disciplines. Pedagogical approaches ought to be grounded in both empirical data and personal accounts, although the latter should not be prioritized over the former. Both of these constructs hold a significant position in the domain of educational psychology; however, they are discernible from each other. The utility of anecdotes in assessing classroom performance is demonstrated by the personal experience accounts furnished by scientists. The utilization of anecdotal approach and anecdotal evidence has been demonstrated to hold significant value in the development of teacher knowledge.

Although subjective evidence could be persuasive, assessing the reliability of narratives can pose a challenge. Scientists discovered that readers did not exhibit sensitivity to the superiority of subjective evidence, contrary to theoretical predictions. Specifically, the persuasive impact of "high-quality" and "low-quality" subjective evidence was found to be equivalent when compared in terms of their influence on participants' opinions. Considering the findings of McNamee et al. [18], this conclusion could offer further rationale for the widespread appeal of MI theory among pre-service educators. The possibility also exists that it could provide support for the contentions of individuals who posit that the Multiple Intelligences theory lacks a solid scientific foundation and, therefore, does not effectively explain the diverse array of intelligences that are present.

Although acknowledging the validity critique of approaches such as MI theory in educational psychology is crucial, it is equally significant to incorporate the qualitative and anecdotal accounts of educators who witness favorable outcomes from differentiated instruction in their classrooms on a daily basis. There is a possibility that the significance of the observable results in the classroom should be prioritized over the semantics of the framework. Given this circumstance, certain educators persist in advocating for the theory of multiple intelligences, exhibiting a seemingly favorable attitude towards the possible benefits it may yield.

Although critical examinations of Multiple Intelligences (MI) theory have contributed to a surge of attention towards discrediting "neuromyths" during the 2010s and 2000s, this interest seems to be subsiding, albeit temporarily. The field of Educational Psychology continues to receive significant attention, as evidenced by the continued popularity of the textbook "Developing Learners" authored by Ormrod [19], which had reached its eleventh edition by that year. The introductory section of this article presents a critical analysis of "neuromyths" aimed at undergraduate pre-service K-12

educators and scholars of psychology. One of the critiques pertains to the notion of multiple intelligences and diverse learning styles. The evaluation was of a heterogeneous nature, with a tendency towards unfavorable feedback.

The review of [20] highlights the persistence of a constructive MI theory perception among preservice teachers, despite the prevalence of this textbook in instructive psychology survey courses in America. This reiterates the initial inquiry regarding the reasons behind this phenomenon. It is plausible that the instructive psychology programs attended by preservice K-12 educators prioritize qualitative interpretation over quantitative inquiry. This tendency may be attributed to the fact that these teachers will be operating within the same school environment and will rely on their personal experiences as educators, as well as those of their mentor teachers, to customize their instructional approaches to suit the unique requirements of their students. In this instance, it is plausible that the experiential knowledge of the student teacher in the educational setting may outweigh their familiarity with the research that scrutinized Multiple Intelligences theory, albeit temporarily.

#### IV. INTEGRATING LEARNING STYLES THEORY CONCEPTS ACROSS LANGUAGE CONTEXTS

It is incumbent upon educators to assist prospective teachers in recognizing the applicability of psychological science research to the practicalities of the K-12 educational environment. Establishing a connection between evidence-centred pedagogical models, such as UDL and UbD, and their application in lesson preparation and classroom practice is imperative for preservice teachers. This linkage can be effectively established through their instructive psychology program. It is plausible that preservice teachers could exhibit a reduced tendency to maintain erroneous convictions regarding learning styles theory and MI theory, provided that they are capable of establishing a connection between their personal experiences and the findings of psychological science research.

The acquisition of knowledge regarding the significance of both quantitative and qualitative research methodologies in the field of instructive psychology is advantageous for individuals who are preparing to become teachers. It is crucial to contextualize the technical and scientific validity of these studies in order to ascertain the most effective methods for communicating and integrating their findings in K-12 educational settings. Providing frameworks for effective instruction and classroom management is crucial in stimulating preservice teachers' reflection on purposeful and inclusive curriculum design. Hence, it is probable that teacher educators ought to emphasize the pragmatic advantages of Multiple Intelligences (MI) theory to facilitate efficacious differentiation of instruction.

An increasing number of research endeavors are being undertaken to assess the validity of MI theory, and the results of these investigations are consistently corroborating the tenets of MI theory. A research was conducted on economics instructors in secondary schools to investigate the extent to which they employed a bodily-kinesthetic approach in their teaching [21]. The study utilized a multiple evaluation of variance to examine the impact of years of educational experience on the instructors' use of this approach. The results revealed significant variations in the use of bodily-kinesthetic approach among the instructors based on their years of teaching experience. In a study conducted on EFL teachers, it was discovered that the implementation of certain activities in their classes was influenced solely by their dominant intelligence type, specifically the logical-mathematical type. Other intelligence types were found to have no significant impact on the types of activities being utilized. A significant observation was made regarding the majority of educators who participated in the survey, as they lacked any formal academic training on the MI theory at the university level. The educators involved in the study lacked exposure to the concept of Multiple Intelligences (MI) during their professional development, leading to their opinions on the matter being deemed uninformed. This provides considerable support on the ideology of logical-mathematical intelligences as posited in the theory of multiple intelligences.

Sariani and Khairat [22] conducted a cross-cultural analysis of EFL students from various countries and cultures, utilizing MI theory to investigate their learning preferences. The objective was to develop a customized curriculum that caters to individual learning styles. Further evidence derived from these research findings supports the notion that the MI theory possesses a compelling potential as an educational framework that can effectively accomplish the objectives of a diverse curriculum. The issue of whether the concept of multiple intelligences (MI) is being utilized in practice as a synonym for individual preferences is being revisited. The correlation between learning styles theory and MI theory, and the way in which MI theory implements learning styles, holds notable importance.

#### *Accuracy in Word Choice of Preferences or Intelligences at the MI Theory Debate*

The discourse surrounding the legitimacy of MI theory could potentially undergo a transformation if the terminology "intelligences" were substituted with the word "preferences." The interchangeable use of the terms "intelligences" and "preferences" may indicate that the MI theory semantics in the setting of teachers' education play a role in shaping the favorable perception of MI theory among a significant number of prospective teachers. Several studies propose that tailoring instruction to a student's preferred learning modality, such as auditory, is a highly efficacious approach. However, the effectiveness of this strategy may vary depending on the subject matter, skill level, or task being taught. Typically, individuals preparing to become educators will encounter the concept of multiple intelligences theory through the lens of a classroom professional. If empirical evidence from classroom observations indicates that the implementation of MI theory is effective in K-12 teaching, then it can be inferred that the significance of technical validity studies would be diminished.

To maintain or enhance students' engagement, differentiation frequently necessitates customizing lessons to their specific preferences. The MI theory has provided a beneficial effect on the instruction of teachers. It is plausible that

ultimately, the discourse surrounding MI theory has been reduced to minor disagreements regarding the theory's nomenclature and the personal advantages of its application. The technical components of quantitative validity are of utmost importance; however, it is imperative to not always prioritize them over the qualitative efficiency of the theory's implementation. This is particularly relevant when considering the observations of student instructors regarding the practical application of the theory. If the implementation of Multiple Intelligences theory appears to generate a heightened level of engagement among students towards the subject matter, it could potentially hold significant implications for contemporary educators. Instances may arise where the practical application of a theory appears to be successful, despite the inability of validation tests to attain or surpass the 90% interval of confidence.

#### *MI Theory Semantics Affect Evaluation Conceptualization*

The late 20<sup>th</sup> century saw the rise in the MI theory popularity as a result of its capacity to address the issue of disparate levels of student engagement, a prevalent aspect of formative evaluation in K-12 education. The ongoing discourse surrounding the MI theory is currently oriented in this direction. A disparity has been observed by scholars between the evaluations of students' inclinations by educators based on MI theory or a comparable, albeit distinct, learning styles theory in the academic setting and the self-evaluations of students' inclinations with regards to the assigned task. When viewed through the lens of MI theory, individual inclinations may be erroneously perceived as MI's construct of intelligence. Cavilla [23] has identified a concern regarding the potential for students to excessively rely on self-assessment due to an excessive emphasis on their preferences. This issue was discussed in the context of a broader discourse on self-assessment. The phenomenon being referred to is commonly identified as the Dunning-Kruger effect.

Substituting "preference" for "intelligence" may mitigate issues of validity, allowing for a comparison between self-assessments and teacher evaluations of assigned tasks or projects, with the latter serving as the foundation for the overall grade. The lexical shift could potentially address the criticisms of the theories of learning styles and the purported impact of Gardner's Multiple Intelligences theory. Other than entirely depending on the learner's self-reported preferences, which could not be completely precise or conducive to achieving the learning objectives, it would be more advantageous for preservice teachers to receive instruction on Universal Design for Learning (UDL). UDL is a framework that takes into account student preferences within an evidence-based approach, thereby personalizing the learning experience to optimize effective learning outcomes.

Numerous research studies have investigated the theory of multiple intelligences (MI) to evaluate its efficacy in evaluating instructional strategies that align with its notion of multiple intelligences. The findings of these studies consistently indicate that there is no statistically significant correlation or validity between the two. Sharma [24] has exhibited statistical significance for specific MI categories or partial significance for one domain while not the other. The ongoing debate surrounding the MI theory is further complicated by conflicting research, which has prompted inquiries into the theory's nomenclature and its relationship with the theory of learning styles. Specifically, the employment of the term "intelligence" in MI theory has the potential to cause confusion from a technical perspective within the field of psychological science. As such, it has been suggested that the term "preferences" may be more appropriate for Gardner's theory.

Research that prioritizes qualitative observation in its evaluation methods and assumes that "intelligences" are synonymous with "preferences" tends to yield more positive results. However, these findings cannot be generalized to the entire population [25]. Studies investigating the implementation of MI theory in evaluating students' advancement through a curriculum grounded in MI theory have produced findings that raise questions regarding the durability of this theory [26]. The aforementioned research, which raises skepticism regarding the applicability of MI theory and its alignment with corresponding evaluation methods, provides support for the implementation of EDI in the setting of English considered a Second Language instruction and other academic domains where its efficacy has been demonstrated. The pedagogical approach of direct teaching is characterized by a structured and scaffolded methodology that bears resemblance to the Explicit Direct Instruction (EDI) model, and shares commonalities with the Universal Design for Learning (UDL) framework.

#### *General Intelligence (g) Semantics or Intelligences Affect Conceptualization of Students Engagement*

Pluye, Grad, Levine, and Nicolau [27] reveal a divergence of opinions regarding the relative significance of quantitative validity researches on different styles of learning against the qualitative effect of these theories in enhancing classroom instructions. Additionally, there is debate on whether prioritizing the pedagogical approach of teaching about Multiple Intelligences (MI) theory from the perspective of students engagement holds greater importance in enhancing overall learning outcomes. Tawalbeh [28] posited that a systematic and intentional implementation of MI theory could potentially yield advantages for all cohorts of students, regardless of their academic proficiency level. The work of Gardner is noteworthy for its significant alteration of the conventional usage of the term "intelligence" in mainstream society. According to scientists, it is crucial to acknowledge that the notion of MI represents a novel type of construct that is founded on a distinct definition of intelligence. According to Shi [29], certain criticism of MI theory were criticized for possessing a "distorted understanding of the theory itself". This was attributed to their utilization of a distinct interpretation of the general intelligence (g) concept compared to Gardner's.

The significance of semantics lies in the necessity for all parties engaged in a discourse to possess a mutual comprehension of the vocabulary employed. Mujib, Sukestiyarno, Suyitno, and Junaedi [30] put forth the argument that Gardner's MI theory was not founded on the pre-existing notion of a solitary general intelligence (g), but rather introduced a novel construct that de-emphasized the importance of a single general intelligence and instead emphasized the concept of MI in the context of K-12 education. Nonetheless, it is not necessary for the two alternatives, namely employing MI theory and abstaining from its use, to be completely incompatible. The implementation of this approach ought to be nuanced within the context of teacher education, in order to account for the intricacies of classrooms that encompass students performing at, below, and above the expected grade level.

The effective utilization of MI theory by preservice teachers can facilitate the achievement of the lesson's learning objectives for all students, thereby fulfilling the intended purpose of the theory. The aforementioned conclusion was drawn based on research findings that exhibited proficiency in cognitive domains beyond the general intelligence factor (g), thereby providing indirect corroboration for the Multiple Intelligences (MI) theory. The impact of MI theory's connections, no matter how tenuous, can have a significant effect on student learning. The concept of intelligence quotient (IQ) has undergone several revisions in light of subsequent research, suggesting that IQ is a significant but dynamic construct that is influenced by the study of general intelligence (g). A plausible construal of Multiple Intelligences (MI) theory underscores the necessity of transcending binary choices in favor of a more sophisticated methodology that considers the distinctive contexts of individual classrooms.

The semantic clarity of the statement is contingent upon the definition ascribed to the term "intelligences". In contrast, UbD and UDL offer pragmatic structures that avoid semantic debates. Educational psychology courses should emphasize UbD and UDL as evidence-based model for pre-service educators to acquire knowledge about effective lesson preparation. Empirical investigations have demonstrated the efficacy of Universal Design for Learning (UDL). A specific study employed an I-CVI (item-level content validity index) to determine that a UDL-oriented methodology was advantageous for fostering "personalized learning" among students in grades 6-12.

## V. DISCUSSION

Gardner's participation in a research endeavor that received backing from the Bernard van Leer Foundation complemented his pre-existing engagement and efforts in the realm of cognitive aptitudes, ultimately culminating in the creation of the Frames of Mind framework. The objective of this initiative was to explore unexplored human capabilities. The individual was assigned by the leaders of the project to gather and organize a comprehensive body of research that examines the convergence of biological and psychological factors in relation to human cognition. The emergence of the hypothesis of multiple intelligences can be attributed to the aforementioned studies. Gardner's research on brain injury was integrated with his expertise in cognitive development, thanks to the support of the van Leer Foundation. The researcher's investigation pertaining to the growth of children's brains has revealed seven distinct modalities through which young minds acquire proficiency in symbol manipulation. The individual and their peers engaged in extensive reading across disciplines such as psychology and anthropology in order to determine a system for categorizing individuals' intelligence quotients. The nomenclature employed by Gardner to refer to the diverse abilities he identified as "intelligences" generated controversy, but ultimately proved instrumental in disseminating his research. According to his statement, had he opted for an alternative term, his level of recognition would not have been as significant as it is presently. The notion put forth by the individual in question was met with rejection by a number of psychologists, as they utilize diverse methodologies in their exploration of cognitive abilities.

The individual's notions pertaining to intelligence are in opposition to the views of psychologists such as Richard Herrnstein, who have maintained for a considerable period that IQ is highly inheritable. According to Gardner, *The Bell Curve*, a book co-authored by Herrnstein, engenders readers' empathy towards individuals with high IQ scores and fails to offer guidance on how to educate those who do not perform well on IQ assessments [31]. According to Gardner, the most appropriate illustration of intelligence is the capacity to efficiently solve issues or generate outcomes that are deemed significant by one or multiple societies. The individual initially identified seven distinct intelligences in the early 1980s, subsequently introducing an additional intelligence approximately ten years later. **Table 1** (below) enumerates the eight intelligences that were acknowledged by him. Gardner recommended that linguistic intelligence is an increasingly shared cognition among humans, as effective communication in the global context necessitates proficiency in semantics, phonology, syntax, and pragmatics. On the contrary, the general populace often perceives the proficiencies of gymnasts, mathematicians, vocalists, and visual artists as unusual or perplexing.

### *Discussion of Teaching Effects*

The topic of differentiation can be approached by utilizing the theoretical framework presented by MI theory. Educational psychology courses designed for prospective teachers ought to prioritize UbD and UDL to ensure that these approaches are easily accessible and can demonstrate their effectiveness in diverse school environments for implementing differentiated strategies across various subject domains and grade levels. It is imperative that preservice educators are provided with access to pertinent examples. The inclusion of UDL in a lesson plan assignment may facilitate the acquisition of proficiency and self-assurance in its utilization among preservice teachers. The researchers in [32] noted that the UDL framework for lesson design had a significant positive impact on both general education and special education preservice

teachers, even after completing a single course. The potential advantages of incorporating evidence-based instructional design and multiple intelligences theory into the education of preservice teachers may be further enhanced by providing them with opportunities to engage in UDL teaching and practical application.

**Table 1. Eight Intelligences Identified**

<b>Linguistic</b>	Proficient linguistic skills enable individuals to effectively communicate not only in their native language but also in other languages. Individuals who engage in writing and public speaking frequently exhibit higher than average intelligence quotients.
<b>Logical-mathematical</b>	Individuals who possess a heightened degree of logical-mathematical intelligence, such as those in the scientific field, exhibit proficiency in numerical manipulation comparable to that of mathematicians. Individuals who possess a high level of familiarity with chains of events tend to exhibit logico-mathematical abilities that are above the average.
<b>Spatial</b>	The capacity to precisely represent the environment is a fundamental element of spatial intelligence. Individuals with a proclivity for spatial intelligence tend to excel in fields such as art, sculpture, and construction. Disciplines such as anatomy and topology rely heavily on spatial intelligence.
<b>Spatial</b>	This form of intelligence is characterized by the ability to employ one's body, either in its entirety or in segments, to create, solve problems, or exhibit movement-related skills during an occasion. The acquisition and application of this type of knowledge is of paramount importance in the fields of athletics and dance.
<b>Bodily-kinesthetic</b>	Individuals possessing a high musical intelligence quotient exhibit exceptional abilities in the areas of pattern recognition, recall, and discernment. Their attention is entirely focused on musical concepts. As per Gardner's Frames of Mind, the development of musical intelligence precedes that of logical and linguistic abilities.
<b>Interpersonal</b>	The possession of empathy is a crucial constituent of interpersonal intelligence. Individuals who possess this cognitive ability have the capacity to comprehend the mental states, emotions, and motives of individuals in their vicinity. Individuals such as educators, medical professionals, and sales representatives are particularly reliant on this type of astuteness and sagacity in comparison to other vocations.
<b>Intrapersonal</b>	Individuals with a high degree of intrapersonal intelligence possess a profound understanding of their own personal identity. Individuals possessing elevated levels of intrapersonal intelligence exhibit greater proficiency in anticipating their own responses to novel circumstances and demonstrate sound judgement in selecting which encounters to pursue. Furthermore, it facilitates the promotion of diversity awareness.
<b>Naturalist</b>	The original seven types of intelligence were expanded to include the naturalist intelligence. The fundamental essence of this notion lies in the ability to distinguish between distinct living entities. Individuals with a high level of this cognitive ability exhibit minimal difficulty in categorizing pebbles and grass into distinct groups.

Several studies have demonstrated the effectiveness of MI theory in promoting differentiated learning and teaching in the classroom through its semantic efficacy. The conceptual framework demonstrated a proficient interface with the theory of learning styles, as the utilization of the term "intelligences" in the MI theory was observed to be nearly identical or at the very least, overlapping with preferences. Hence, the research design of a study plays a crucial role in determining the nature of qualitative observations, which often tend to provide favorable interpretations to counterbalance the relatively ambiguous quantitative data. The comparison between the traditional general intelligence (g) concept and its pluralized and modified version in MI theory involves the utilization of the term "intelligences" in the exposition of findings. The widespread usage of the technique is emphasized by Wahab et al. [33], who suggest that preservice teachers' exposure to educational psychology should include a discussion of it as an approach to differentiation. It is imperative to incorporate UbD and UDL methodologies in all instructional sessions to underscore the importance of these pedagogical frameworks.

Teacher educators may refer to the Multiple Intelligences (MI) theory as a potential source of guidance for enhancing students' motivation towards learning. The teacher educator may encompass three distinct stages. The study proposes that preservice teachers should examine the Multiple Intelligences (MI) theory by considering preferences associated with each of the eight intelligences. This approach involves designing projects that offer students various options, with a focus on recognizing that MI theory can aid in envisioning differentiation in project design. However, it is important to acknowledge the issue of validity when referring to preferences as "intelligences." (2) The incorporation of instructional exercises that enable prospective educators to engage in project design within their respective subject areas, with a focus on accommodating preferences through the utilization of UbD or UDL strategies; and It is crucial to bear in mind that a student's self-reported inclination towards a particular learning style does not constitute proof that it is the modality by which they assimilate the maximum amount of information.

The introduction of standardized tests in the classroom should be preceded by a discussion of the concepts of general intelligence (g) and validity, as these are relevant to psychological research. Standardized tests, which rely on the



traditional concept of *g*, typically do not feature prominently in the daily instructional activities of students. However, they play a vital role in assessing overall intelligence over time and in identifying the specific educational needs of students requiring special services. The trend of an increasing number of educational institutions dispensing with standardized tests like the ACT or SAT as a prerequisite for admission may indicate a change in attitudes or influences concerning the efficacy of a solitary, all-encompassing intelligence metric (*g*) in ascertaining a student's eligibility for enrollment in higher education institutions or academic curricula. The aforementioned progress indicates that the significance of Multiple Intelligence theory within the broader discourse on personalized learning and assessment will endure.

Encouraging prospective educators to acquaint themselves with the techniques of student engagement presented by MI theory is of utmost significance. The concept of general intelligence and the alternative approach to intelligence as preferences proposed by MI theory can be effectively presented to students through the implementation of the think, pair, and share learning strategy and a diversified curriculum format. Prospective teachers acquire an understanding of the technical aspects of intelligence definitions formulated by educational psychologists, and they engage with MI theory in manners that are beneficial for executing variation tactics in K-12 educational settings.

Incorporate a module on the accuracy of semantics and language in relation to MI theory and specialized language within various disciplines, within a unit on learning style theories that is imparted to prospective educators in a class on educational psychology. Despite their distinctness, there exist certain shared conceptual objectives between MI theory and learning styles theory. An effective approach to facilitate the development of a knowledgeable perspective and understanding of Multiple Intelligences (MI) theory among prospective educators is to engage them in a discourse that encompasses the theory's inception, its influence, and its optimistic implications for fostering diversity. The present study aims to elucidate the potential of explicit direct instruction in teaching skills and material, using the Universal Design for Learning and Universal Basic Education as case studies.

Specifically, the study seeks to explore how explicit direct instruction can be employed to facilitate effective learning outcomes in these contexts. Subsequently, the prospective instructors should engage in a task aimed at developing a project blueprint for the purpose of crafting a lesson plan that adheres to the principles of Universal Design for Learning (UDL) or Understanding by Design (UbD). Simultaneously, it is recommended that students engage in a unique academic undertaking within their respective field of study, while utilizing a combination of eight intelligences as proposed by MI theory. Categorize pupils based on their academic discipline and level, subsequently task them with scrutinizing and contrasting the frameworks through the utilization of the project designs they have formulated.

In order to effectively cater to the diverse needs of students, it is imperative for educators to employ differentiated instruction. Gardner's MI theory serves as a useful model for achieving this goal. In the event that educators prioritize the development of certain intelligences over others, it may result in an inequitable disadvantage for students who possess exceptional abilities in the disregarded intelligences. Distinguishing educational approaches for students with differing levels of intellectual ability within a shared classroom setting may present a challenge. One potential challenge for educators is how to effectively cater to the diverse learning styles of their students, such as accommodating a student who favors a kinesthetic learning approach and another who possesses advanced visual-spatial abilities and linguistic proficiency. According to Gardner, it is possible for educators to optimize students' abilities by utilizing multiple modalities to convey information. The use of standardized testing has garnered criticism due to its inability to measure various forms of intelligence such as interpersonal, intrapersonal, musical, and kinesthetic, all of which were identified by Howard Gardner.

The scope of these assessments is restricted to the evaluation of only two cognitive abilities, namely linguistic and mathematical intelligences. When educators' evaluation is partially based on the academic achievements of their students, they may experience a compulsion to concentrate solely on the cognitive abilities that are assessed. Although the Every Student Succeeds Act (ESSA) reduced the quantity of standardized assessments administered, a considerable proportion of the testing mandates established by the No Child Left Behind (NCLB) legislation were retained. Moreover, educational institutions may abstain from embracing the MI theory of education owing to the erroneous belief that a standardized approach to instruction is equitable, notwithstanding the imperative for students to perform well on standardized tests. One could posit that implementing uniform evaluation and instructional methods for all students is a just approach. This pedagogical approach assumes a uniform learning style among all students.

Nonetheless, as per the Multiple Intelligences theory, it is improbable that pupils who exhibit inadequacy in a particular intelligence will acquire knowledge effectively if educators predominantly employ the intellect in which the students are deficient. If a teacher prioritizes language-based instruction, a student with limited verbal proficiency may face greater challenges in achieving academic success compared to a peer with advanced verbal abilities. A student who has limited verbal communication skills can still achieve academic advancement if the educator incorporates a variety of visual aids such as pictures, images, photographs, and drawing exercises into their teaching methodology. Additionally, if the student has developed spatial abilities, this can further enhance their learning experience.

According to Nanda et al. [34], there exist several rationales that may lead educators to disregard certain students' cognitive abilities and instead prioritize instructing them through language and reasoning. Initially, it is possible that individuals may not be cognizant of the fact that their students possess distinct cognitive mechanisms. Secondly, educators may experience a sense of powerlessness in catering to the educational requirements of a heterogeneous student population with varying levels of cognitive abilities. Thirdly, it is possible that individuals may hold the belief that students must

strive to conform to a certain standard in order to effectively participate in society, regardless of their individual differences. Educators who prioritize addressing students' weaknesses over their strengths may not only deliver inadequate instruction, but also run the risk of fostering feelings of inferiority among certain students. During a recent interview, Gardner emphasized the importance of instructing standard curriculum themes by utilizing the strengths of students. If educators focus on their students' weaknesses rather than utilizing a positive approach, it is probable that the students will develop low self-esteem. Providing students with the opportunity to develop their strengths is a crucial aspect of education. During a recent interview, Gardner cited physics as an instance where an alternative approach that does not prioritize the textbook may prove effective in providing education through the intelligences that are frequently overlooked. The kinesthetic intelligence of students can potentially facilitate their comprehension of physics concepts.

#### *Potential for the Future*

The domain of physical classrooms is currently thriving. A considerable number of individuals employed in the field of MI have not perused my written material or that of other reputable scholars, and professionals often fail to stay abreast of theoretical advancements. It appears that the current circumstance is immutable.

Undoubtedly, the notion of multiple intelligences is poised to persist in diverse contexts such as educational institutions, higher education establishments, and professional environments across the world. Initially, a significant proportion of applications will primarily focus on superficial enhancements. The primary focus of my inquiry pertains to the persistence of trials and the potential for increased comprehension over time. Additionally, I am interested in investigating the extent to which the adoption of Multiple Intelligences (MI) concepts contributes to the advancement of educational objectives within institutions. Hence, I express my admiration towards institutions that engage in critical thinking regarding their approaches and employ both quantitative and qualitative measures to evaluate the effectiveness of their MI endeavor.

Establishing a causal relationship between MI practices and student performance outcomes presents a formidable challenge. Empirical investigations that maintain all variables constant except for MI procedures are not feasible to conduct in the authentic educational setting. I have received feedback suggesting that I should express greater confidence in my assertions regarding the efficacy of MI techniques. Reluctance to rely on motivational interviewing (MI) begins not from a lack of confidence in its efficacy but rather from the inherent difficulty in establishing a causal relationship between MI and observed outcomes. Empirical investigations such as the SUMIT study are of paramount importance. Although it may not be a personal interpretation, it is anticipated that psychologists will ultimately adopt the notion of multiple intelligences. Psychologists tend to prefer test-based research, but it is worth considering whether this method is optimal for exploring various forms of intelligence.

It is probable that a limited number of educational institutions operating within the traditional framework have overtly adopted the principles and methodologies of Multiple Intelligences theory. The scholarly investigations conducted by my colleagues are poised to serve as a catalyst for educational practitioners to enhance their pedagogical approaches, course content, and assessment methodologies. The recognition or lack thereof of MI theory holds negligible significance. The critical comprehension of the MI theory is that people possess distinct cognitive variances across multiple domains that are relatively autonomous. In addition to its evolutionary significance, the diversity in question contributes to the enrichment of our daily lives. For a significant portion of documented history, instructors have prioritized uniform classrooms and evaluations over acknowledging the variety of learners.

It is possible that I played a minor role in subverting this institutional tendency; however, computers are poised to assume a significantly greater role in this regard. Currently, the utilization of software that simulates multiple intelligences has enabled a significant level of customization in education for individual students. The scope is anticipated to expand in the future, whereby "intelligent systems" will be utilized to customize instruction according to the distinct abilities and interests of individual students. It is anticipated that in the next five decades, the notion of a singular optimal approach to educating and evaluating students will not be regarded with much credibility. Rather than employing a one-size-fits-all approach, educators will seek out the most efficacious pedagogical and evaluative techniques tailored to the unique needs of the individual student. Assuming that the scientific underpinnings of Multiple Intelligences (MI) theory have advanced as anticipated, it would be plausible to offer a rationale for the efficacy of this pedagogical approach that incorporates the influence of biological, psychological, and cultural factors.

## VI. CONCLUSION

This article shows that there exists a continuing debate regarding the applicability of the MI theory and its correlated learning styles theoretical concept. Nevertheless, this conceptual analysis comprises specific experiments that have yielded encouraging outcomes. It identifies a concurrence between the benefits of Multiple Intelligences (MI) theory and the outcomes of numerous empirical studies. In order to guarantee that forthcoming educators possess a comprehensive understanding of the theoretical underpinnings spanning various eras, a number of authors in the scrutinized literature have articulated concerns and proffered divergent perspectives on this discourse. It is imperative that individuals approach classroom discussions on the topics of multiple intelligences and learning styles with a scholarly outlook. In order to establish a foundational understanding, it is imperative to explicate the definition of "intelligence" and its correlation with "intelligence quotient" (IQ), as well as its connection to "general intelligence" (g). It is recommended that preservice

educators be exposed to both the critical research on Multiple Intelligences (MI) theory and the studies that have yielded positive results. Additionally, it is emphasized that the UDL (Universal Design for Learning) and UbD (Understanding by Design) frameworks be utilized as evidence-based approaches in K-12 classroom settings.

#### **Data Availability**

No data was used to support this study.

#### **Conflicts of Interests**

The author(s) declare(s) that they have no conflicts of interest.

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#### **Ethics Approval and Consent to Participate**

The research has consent for Ethical Approval and Consent to participate.

#### **Competing Interests**

There are no competing interests.

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