

PEOPLES' DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH



Abdelhamid Ibn Badis University of Mostaganem
Faculty of Foreign Language
Department of English

Integrating Bloom's Taxonomy into Algerian Primary Schools to Study the Cognitive Development of Young English Learners from A Neuroscience Perspective:
Derdour Belkacem and Abdelhamid Ibn Badis Primary Schools, as a Case Study

Research Thesis Submitted to the Department of English as a Partial Fulfilment of the Requirements for the Master's Degree in English Language and Communication

Submitted by: Yasmine Maroua Benmerzouka

Supervised by: Prof. Dr. Hanane Sarnou

Board of Examiners

Examiner1: Dr Cherif Tegua

Supervisor: Prof. Dr. Hanane Sarnou

Examiner 2: Prof.Dr. Dalal Sarnou

Academic Year: 2023/2024

Dedication

I dedicate this work to my parents, the ones who raised and encouraged me during my educational path, especially my lovely mother, “Meriam” who believed in me and made me the woman I am today.

A special thanks to my sister “Zahira” (my second mother), who encouraged me to reach my goals and made me believe in myself.

To my two brothers, “Hadj Mohamed and Abdelhafid,” who were always there to cheer me on and lift my spirits during my academic journey.

A special thanks to my best friends whom I consider sisters, “Yasmina and Ghizlene”. Thank you for supporting me and always pushing me to do my best.

I would also like to thank my friends “Aya, Nada, and Senia” who have become my family; I would never have made it without them.

To all MA Language and Communication classmates, especially “Cerine,” with whom I shared a wonderful learning experience.

Finally, I dedicate this work to “Me” for my hard work and perseverance.

Acknowledgements

This study would not have been completed without the blessings and guidance of Allah.

I would like to express my sincere gratitude to my supervisor, Prof. Dr. Sarnou Hanane, for her constant support, mentorship, and constructive feedback throughout my academic journey. Her extensive knowledge, expertise, and motivation were significant in helping me develop as a more ambitious student.

Thank you, Prof. Dr. Hanane Sarnou, for your constant encouragement and emotional support, which instilled in me the belief that I can achieve great things in this life. Her direct critiques pushed me to challenge myself and seek excellence. I am truly grateful for all her efforts and the trust she has placed in me.

I would also like to extend my gratitude to Prof. Dalal Dr. Sarnou for her assistance with my research and her hard work over the past two years. Her professionalism and dedication to her work have been a source of inspiration, motivating me to develop my own skills.

A special thanks to Dr. Fatima Benchohra for taking the time to meet with me and share her experience and knowledge.

I would like to thank the board of examiners for their time and for agreeing to read and provide feedback on my thesis.

Finally, I would like to express my gratitude to all my Master's language and communication teachers for their support and guidance over the past two years.

Abstract

Bloom's Taxonomy is a structured framework for designing educational activities that promote different cognitive levels, from basic knowledge recall to higher-order thinking skills and neuroscience is required in the Algerian educational settings. In this context, this research study attempted to investigate how effectively primary school teachers in Algeria integrate Bloom's Taxonomy into their English language lesson plans, the cognitive outcomes for young learners, and the role of neuroscience in enhancing these outcomes. We used a mixed-methods research design to conduct our research study, incorporating a primary school teachers' questionnaire, interviews with medical teachers, and classroom observations. Our participants were 3rd and 4th-grade pupils at Derdour Belkacem and Abdelhamid Ibn Badis primary schools during the second semester, with 15 primary school teachers and two medical teachers at the faculty of medicine at Abdelhamid Ibnbadis University. The results indicated that while teachers recognize the benefits of Bloom's Taxonomy, its implementation is limited to the lack of training. However, when it is appropriately applied, it enhances memory retention, attention, and critical thinking among students. Furthermore, integrating the principles of neuroscience, such as the impact of attention on learning, can improve these cognitive outcomes. This research highlighted combining educational strategies with neuroscience to promote more effective language learning and cognitive development in young Algerian learners.

Keywords: Bloom's Taxonomy, cognitive development, critical thinking, memory retention, Neuroscience

List of Figures

Figure 1: <i>Bloom's taxonomy from a longer piece on the taxonomy of Bloom</i>	22
Figure 2: <i>exploring the use of Bloom's Taxonomy in the lessons</i>	46
Figure 03: <i>Exploring teachers' professional training</i>	47
Figure 04: <i>Exploring the incorporation of Bloom's Taxonomy in lesson planning</i>	47
Figure 05: <i>Exploring the challenges and difficulties of implementing Bloom's Taxonomy</i>	48

List of Abbreviations and Acronyms

MRI: Magnetic resonance imaging.

ACGME: Accreditation Council for Graduate Medical Education.

fMRI: Functional magnetic resonance imaging.

COVID-19: Coronavirus disease 2019.

ICT: Information and communications technology.

UNESCO: United Nations Educational, Scientific and Cultural Organization.

DP: The declarative procedural.

SMART: Self-directed, Motivated, Adaptive, Resource-enriched, and Technology integrated.

SLA: Second Language Acquisition.

BBT: Blooming Biology Tool.

BAT: Blooming Anatomy Tool.

SOLO: Structured of Observed Learning Outcomes.

Table of Contents

Abstract.....	I
Dedication.....	II
Acknowledgments.....	III
List of Figures.....	IV
List of Abbreviations.....	VII
Table of Contents.....	VIII
Appendices.....	IX
General Introduction.....	1
 Chapter one: An overview	
1 Introduction.....	5
1.1 What is neuroscience?.....	5
1.1.1 The History of Neuroscience.....	6
1.1.2 How does the brain function?.....	7
1.1.3 Neuroscience and education.....	8
1.1.4 The Connection between Education and Learning.....	9
1.1.5 From home to the classroom.....	11
1.1.6 How to learn a language?.....	12
1.1.6.1 Attention.....	13

1.1.6.2 Memory.....	14
1.1.6.3 Emotion.....	15
1.1.6.4 Motivation.....	16
1.1.6.5 Creativity.....	17
1.2 language acquisition.....	18
1.2.1 Language acquisition: The Krashen perspectives.....	19
1.2.1.1 The Five Hypotheses by Stephen Krashen.....	20
1.3 Bloom's taxonomy.....	21
A. Knowledge.....	22
B. Comprehension.....	22
C. Application.....	22
D. Analysis.....	22
E. Synthesis.....	23
F. Evaluation.....	23
1.3.1. The Role of Bloom's taxonomy.....	24
1.3.2. The educational objectives of Bloom's taxonomy.....	25
1.3.3. Domains of Bloom's taxonomy.....	27
A. The Cognitive domain.....	27
B. The Affective domain.....	29
C. The Psychomotor domain.....	30
1.4. Conclusion.....	31

Chapter two: Research Methodology

2. Introduction.....	33
2.1 Research Design.....	33
2.2 Research Method.....	34
2.3 Context.....	34
2.4 Procedure.....	35
2.5 The Sample profile.....	35
2.5.1 The Teacher’s profile.....	36
2.5.2 The Medical teachers’ profile.....	36
2.5.3 The Students’ profile.....	36
2.6 Data Collection Instruments.....	36
2.6.1 Questionnaire.....	37
2.6.2 Teachers’ questionnaire.....	37
2.6.3 Description of Teachers’ questionnaire.....	37
2.6.4 Interview.....	38
2.6.5 The Medical teachers’ interview.....	39
2.6.6 Description of the Medical teachers’ interview.....	39
2.6.7 Observation.....	40
2.6.8 Classroom observation.....	40
2.7 Research study limitations.....	43
2.8 Conclusion	43

Chapter three: Data Analysis and Results Discussion

3 Introduction.....	45
---------------------	----

3.1. Data Analysis.....	45
3.1.1 The Analysis of the teachers' questionnaire.....	45
3.1.2 The Interpretation of the teachers' questionnaire.....	53
3.1.3 The Analysis of the Medical teachers' interview.....	53
3.1.4 The Interpretation of the Medical teachers' interview.....	57
3.1.5 The Analysis of the Classroom Observation.....	58
3.1.6 The Interpretation of the Classroom Observation	50
3.2 Discussion of the Results.....	60
3.3 Suggestions and Recommendations.....	64
3.4 Conclusion.....	65
General Conclusion.....	66
References.....	68
Appendices.....	95

General introduction

In an increasingly interconnected world, proficiency in English has become a highly valued skill, particularly in the context of young Algerian learners in primary schools. The integration of English education in primary schools not only provides students with the opportunity to develop language skills for their future success but also plays a significant role in fostering their cognitive development through the application of Bloom's Taxonomy. The latter, a framework for categorizing educational goals and organizing learning, includes six levels in the cognitive domain: knowledge, comprehension, application, analysis, synthesis, and evaluation (Cicek, J. S., Labossiere, P., & Ingram, S. 2015). The application of this taxonomy in English instruction in Algeria, specifically in primary schools, is essential for promoting higher-level thinking skills and cognitive development among young learners.

Furthermore, the role of Bloom's Taxonomy in the context of English language instruction in Algeria is crucial for ensuring that students not only acquire language proficiency but also develop the cognitive skills necessary to succeed in their academic journey. By aligning English education with the principles of Bloom's Taxonomy, educators can effectively promote the development of higher-order thinking skills, critical thinking, and creativity among young Algerian learners. The integration of Bloom's Taxonomy in English instruction in Algerian primary schools not only enhances language acquisition but also contributes to the cognitive neuroscience development of young learners.

Neuroscience significantly influences how we learn a foreign language by providing insights into brain function and development. Research shows that learning a language can reshape the brain's structure and how neurons work, regardless of age. Moreover, body movements and imitation neurons play key roles in language learning, emphasizing the need to incorporate these elements into teaching. Neuroscience also helps us

understand how anxiety about learning a foreign language affects brain activity. By integrating neuroscience principles into language teaching, educators can enhance their methods and support more effective language learning. Learning a foreign language in a socially interactive setting further promotes positive brain changes and behavioral outcomes. These findings highlighted that applying neuroscience in language instruction can improve language learning and cognitive development for young learners in Algerian primary schools. Therefore, our research aims to develop the following research questions:

- How effectively do primary school teachers in Algeria integrate Bloom's Taxonomy into their English language lesson plans, and what factors influence their ability to do so?
- What are the impacts of Bloom's Taxonomy on the cognitive development of young English learners in Algerian primary schools, particularly in terms of memory retention, attention, and critical thinking skills?
- How does integrating neuroscience principles enhance the neurocognitive development of young English learners in Algerian primary schools?

Reflecting upon the above research questions, we reformulated the following hypotheses:

- Primary school teachers in Algeria vary in the effectiveness of integrating Bloom's Taxonomy into their English language lesson plan; factors such as teacher training, familiarity with Bloom's Taxonomy, and classroom resources would strongly influence the learner's abilities.
- Integrating Bloom's Taxonomy would positively impact the cognitive development of young English learners in Algerian primary schools, specifically by enhancing memory retention and attention focus and fostering the development of critical thinking skills.

- Integrating neuroscience principles in English language instruction would positively influence the neurocognitive development of young learners in Algerian primary schools, specifically when incorporating neuroscience principles.

The primary goal of this study is to highlight how Bloom's Taxonomy is applied in educational settings and how it affects learners' neurocognitive skills. It also examines how well the six levels of Bloom's Taxonomy work together to develop higher-order thinking abilities. It also explores the link between cognitive abilities and language acquisition from a neurocognitive standpoint.

The present thesis has three chapters. The first chapter is devoted to an overview of the integration of Bloom's Taxonomy into Algerian primary schools and its development from a cognitive neuroscience standpoint. The second chapter presents the research methodology for conducting our study, including the strategies chosen and the data collection tools utilized. The third chapter is devoted to analyzing and discussing the results obtained from the respondents.

Chapter One: An

OVERVIEW

1. Introduction

This chapter presents a related overview of the integration of Bloom's taxonomy into Algerian primary schools to study young English learner's development from a cognitive neuroscience perspective. The first part introduces the field of neuroscience and its history, providing an overview of how the study of the nervous system has evolved over time and its relevance to education. This section discusses the concepts of neuroscience and its implications for learning and language acquisition. It also examines the relationship between neuroscience and education, highlighting the insights from neuroscience that benefit educational practices. The second part delves into the process of language acquisition to discuss the cognitive abilities involved in learning a foreign language. Furthermore, it covers various theories of language acquisition and specific strategies that can be employed to enhance language learning. The last part of the chapter provides an in-depth analysis of Bloom's Taxonomy, its relevance to educational practices, and its application in the context of Algerian English language education.

1.1.What is neuroscience?

The study of the nervous system, which includes the brain, spinal cord, and neural network, is known as neuroscience. In order to comprehend the structure and operation of the nervous system as well as how it affects behavior and cognition, it incorporates knowledge from a variety of disciplines, including neurobiology, psychology, and bioethics (Illes & Bird, 2006; Haier, 2016). With the development of neuroimaging techniques, which are vital to understanding the brain and its functions, the study of neuroscience has advanced dramatically (Weisberg et al., 2008).

As a result, subfields like neuroethics which look at the moral, legal, and social consequences of neuroscience research, have also emerged (Dussauge & Kaiser, 2012). Universities now offer a lot of courses in neuroscience, which has piqued students' interest in

attending medical school or neurology and related subjects graduate programs (Khodabocus et al., 2015). Therefore, it has been acknowledged that incorporating neuroscience information into different fields, like psychiatry, is crucial to comprehending mental diseases from a neuroscientific standpoint (Shalev & Jacoby, 2018; Ross et al., 2015). Due to its possible usefulness in educational settings, the use of neuroscience in education, or "educational neuroscience," has drawn interest (Macdonald et al., 2017). According to Myers et Burgess (2003), there is a growing focus on making neuroscience knowledge available to the public, showing that its impact goes beyond just academic circles.

Furthermore, neuroscience nursing has gained popularity by combining neuropsychiatric and neuroscience knowledge into psychiatric practice (Nurse.com, 2024). Websites like Textpresso for Neuroscience highlight the importance of easy access to resources and information for the neuroscience community (Gardner et al., 2008), but incorporating neuroscience into psychiatry, education, and practical problem-solving is not without its difficulties. One challenge in adding a neuroscience perspective to psychiatry is the common belief that neuroscience doesn't relate to patient care (Ross et al., 2015). Furthermore, as the developing discipline of critical neuroscience has shown, the study of neuroscience must consider environmental and cultural influences on research and conclusions (Chiao et al., 2013).

1.1.1 The history of neuroscience.

Neuroscience has a rich history full of important events that have made it what it is today, from learning about the brain's structure to creating high-tech brain scans, which have undergone a remarkable evolution. The creation of functional MRI was a significant breakthrough in understanding how the brain works (Haynes, 2015). This technological advancement allowed neuroscientists to explore brain function in amazing detail, and the discovery of how different brain areas connect while at rest using MRI helped us understand

the history and important moments that made this tool widely accepted in neuroscience (Michael J. Lowe, 2010). Similarly, the convergence of artificial intelligence and neuroscience has led to the development of deep networks guided by insights from neuroscience (Surianarayanan et al., 2023). Likewise, the history of neuroscience is also mixed with significant developments in understanding brain structure and function. For instance, recent knowledge of brain white matter anatomy represents a vital milestone in modern neuroscience and neurosurgery development (Corte et al., 2022).

Moreover, the role of glial cells in brain function has been re-evaluated, leading to surprising and remarkable discoveries in the field of neuroscience (Gallo, 2010). The discovery of the trigeminal cardiac reflex has also been considered a major achievement in neuroscience in the last 20 years (Chowdhury et al., 2017). Furthermore, integrating neuroscience knowledge and neuropsychiatric skills into psychiatry has been a significant development in the field of mental health. The clinical neuroscience milestones adopted by the ACGME have specified the competency requirements for psychiatry residents in neurodiagnostic and neuropsychological testing and knowledge of neurological and psychiatric comorbidities and the neurobiology of psychiatric disease (Schildkrout et al., 2016).

1.1.2 How does the brain function?

The brain functions through a complex interplay of structural and functional networks, which are essential for understanding brain activity and cognition (Simpson et al., 2021). Functional magnetic resonance imaging (fMRI) has become a foundation in cognitive neuroscience, allowing researchers to study brain function in an unmatched detail (Logothetis, 2008). Despite major progress, we still do not fully understand how the brain works and how we think (Bassett & Sporns, 2017). Studies using computer models have shown that damage to important central areas or connections in the brain has a wider impact on brain structure and

function compared to damage to less important outer areas (Fornito et al., 2015). The emerging field of network neuroscience uses functional connections between brain regions to model brain subsystems, offering crucial insights into how the brain's network structure influences cognition, disease, development, and aging.

Furthermore, cognitive centers are implicated in many diseases and can result in generalized and catastrophic failures in cognitive function (Medaglia et al., 2015). The brain's structure is shaped by genetic and phylogenetic axes, with the evolution of the human brain being related to genes involved in neurogenesis and myelination (Valk et al., 2020). Additionally, functional brain networks are dominated by stable group and individual factors rather than cognitive or daily variation, and sources of variation are differentially distributed across the brain and linked to intrinsic and task-evoked sources (Gratton et al., 2018). The relationships between social context and the brain may vary across an individual's life and as a function of the context in which individuals operate (Falk et al., 2013). The brain's network of discrete yet interconnected areas is a key focus in the emerging field of network neuroscience, which helps us understand psychiatric disorders and create new ways to identify them (Murphy & Bassett, 2017). Moreover, the efficacy of cognitive rehabilitation for brain injury remains a topic of debate, with studies showing conflicting opinions on its impact on cognitive functioning (Samuel, 2008).

1.1.3 Neuroscience and education

The intersection of neuroscience and education has gotten a lot of focus, with more and more studies looking into how they could work together and what difficulties they might face (Han et al., 2019), emphasizing the importance of connecting levels of analysis in educational neuroscience by providing concrete examples to illustrate the multi-level structure of educational neuroscience (Han et al., 2019). This review shows how important it is to really understand how neuroscience and education connect. But, there is a problem because many

educators believe in neuromyths, which makes it harder, as highlighted by (Dekker et al., 2012). These misconceptions emphasize the necessity for enhanced interdisciplinary communication to reduce misunderstandings and establish successful collaboration between neuroscience and education. They also raise practical and principled problems with educational neuroscience, emphasizing the wide gap between neuroscience and education (Bowers, 2016). This analysis suggests the need to consider how useful neuroscience is for teaching; different teachers have different opinions about how much neuroscience helps in education, as evidenced by the findings (Pickering & Howard-Jones, 2007).

Many people are excited about combining neuroscience and education but have different ideas about how to do it. Gabrieli (2016) talks about how neuroscience can help improve education by providing basic research that supports educational theories. Also, the growing role of neuroscience in teaching medicine is seen in the way psychiatry has moved from just being taught in classrooms to being practiced in clinics (Arbuckle et al., 2019); this highlights the need for incorporating neuroscience into diverse educational contexts, including medical training. Furthermore, the potential of instilling education with brain research to improve teaching and enhance productive learning is emphasized by (Friedman et al., 2019), pointing to the value of evidence-based pedagogical practices empowered by neuroscience.

1.1.4 The Connection between education and learning

The relationship between education and learning has been extensively studied, particularly in light of recent global events such as the COVID-19 pandemic. (Tang et al., 2021) conducted a comparative analysis of students' live online learning readiness during the pandemic, emphasizing the need for dynamic participation and learner control during the learning process; this aligns with the findings of (Wargo & Vilceanu, 2011), who highlighted new discoveries in the 'science of learning' that integrates psychology, neuroscience, machine

learning, and education to understand how the human brain works. These studies emphasize the importance of understanding the psychological and neurological aspects of learning to enhance educational practices.

Furthermore, (Tchamyou et al.,2019) highlighted how information and communications technology (ICT) could influence how education and lifelong learning affect income inequality and economic growth. This supports UNESCO's focus on enhancing early childhood education and improving learning outcomes, especially in primary schools. Additionally, (Luczak et al., 2022) emphasized the role of predictive coding and statistics to help connect different brain-inspired algorithms, which helps build a general theory of how neurons learn. Online remote education affects nursing students' learning was investigated by (Ali et al., 2020), who identified principles highly impacted by online learning, including the provision of effective educational information, sufficient assistance, and contingency planning for unforeseen events. Similarly, (Jiang et al.,2021) explored online learning satisfaction in higher education during the pandemic, emphasizing the widespread adoption of technology platforms to support learning.

Moreover, (Dekker & Jolles, 2015) highlighted the effects of teaching about "brain and learning" on teachers' knowledge and students' theory of intelligence, emphasizing the importance of integrating neuroscience into educational practices. This integration is further supported by (Duijvenvoorde et al., 2022), who challenged the idea that learning difficulties are linked to specific neuro-anatomical substrates, emphasizing the interactions and organizational properties between different brain systems. The impact of high-impact educational practices on students' learning outcomes was investigated by (Anandapadmanabhan et al., 2022), emphasizing the need to shift from memorization-based approaches to learning to more impactful educational practices. Additionally, the COVID-19

pandemic has significantly influenced the higher education system, leading to the adoption of e-learning platforms to ensure the continuity of teaching and learning activities.

1.1.5 From home to the classroom

The transition from home to the classroom requires more consideration because of various factors that may influence this shift. The latter can significantly impact students, teachers, and parents. Many researchers have attempted to examine the shift from home to school from multiple perspectives, including psychological, social, and educational aspects: (1) From a psychological standpoint, the transition from home to the classroom can evoke a range of emotions and behaviors in students. Accordingly, (Vygotsky,1978) emphasized the role of social interaction and cultural context in shaping children's cognitive development. For him, shifting from the familiar home environment to the structured classroom setting might influence students' cognitive processes, emotional well-being, and social interactions. Also, the work of Bronfenbrenne (1979) highlighted the connection of various environmental influences on individuals; it suggests that the transition from home to the classroom involves a shift in the microsystem (home) to the mesosystem (school), which can impact students' adaptation and adjustment. (2) From a social perspective, the transition from home to the classroom involves navigating new social dynamics, peer relationships, and authority figures.

Likewise, (Eccles & Roeser, 2011) highlighted the significance of school context in shaping students' social and emotional experiences. The transition to the classroom setting may require students to negotiate new social roles, expectations, and norms, which can influence their sense of belonging and identity within the school community. In terms of educational implications, the transition from home to the classroom necessitates a shift in learning environments, instructional methods, and academic expectations.

1.1.6 How to learn a language?

Research has shown that language acquisition, whether it is the first, second, or third language, is a complex process that involves input from the environment, individual cognitive factors, and learning strategies (Goswami, 2019; Westergaard, 2019; Deng & Zou, 2016; Elgamal, 2019); for example, children learn their first language by actively engaging with the language in their environment, and they are motivated to learn because they perceive language as a means to fulfill their needs (Deng & Zou, 2016); this process is characterized by the child's ability to autonomously and spontaneously acquire language at an early age (Elgamal, 2019); the acquisition of a second or third language involves analyzing and individual acquisition, which is fundamentally similar to first-language acquisition (Westergaard, 2019). Additionally, bilingual acquisition can involve the acquisition of more than two languages, and bilinguals are more experienced language learners who have potentially developed learning strategies to a larger extent than monolinguals (Genesee, 2000; Cenoz, 2011). Furthermore, the role of learning strategies in language acquisition is crucial, as learners manage to tailor their strategies to the language task and their personal needs (Green & Oxford, 1995). Learner autonomy in language learning is also essential; it enables individuals to take responsibility for their learning purposes and the language (Nguyen & Nguyen, 2020; Benson, 2007). Language learning strategies, defined as specific actions or techniques that students use to improve their progress in developing second language skills, play a significant role in the learning process (Özdemir&Özkan, 2016).

Moreover, the influence of bilingualism on third language acquisition has been studied, indicating that bilinguals have potentially developed learning strategies to a larger extent than monolinguals (Cenoz, 2011). Transitioning from the general concept of learning a language, let us now delve into the specific strategies employed to enhance language learning. These

strategies encompass attention, memory, emotion, motivation, and creativity, each playing a distinct role in the language learning process. By examining these strategies individually, we can gain a comprehensive understanding of how they contribute to effective language acquisition.

1.1.6.1 Attention

When it comes to learning a new language, attention plays a crucial role in the process. Research has shown that attention is essential for language acquisition and proficiency. According to a study by Chun and Turk-Browne (2007), attention facilitates the encoding and retrieval of linguistic information, which is vital for language learning. Furthermore, attention helps learners focus on relevant linguistic input and filter out irrelevant information, leading to improved comprehension and retention of the language (Conway et al., 2001). In the context of language learning, attention can be divided into different types, such as selective attention, divided attention, and sustained attention. Selective attention allows learners to concentrate on specific language features or content, which is beneficial for vocabulary acquisition and grammar comprehension (Lin, 2009). Divided attention, on the other hand, enables learners to process multiple language inputs simultaneously, such as listening and reading, which can enhance overall language proficiency (Mishra, 2012). Sustained attention is important for language practice and production, as it enables learners to maintain focus during extended periods of language use, leading to improved fluency and accuracy (Parasuraman, Warm, & See, 1998).

Moreover, attention in language learning is influenced by various factors, including motivation, cognitive abilities, and external distractions. Motivation plays a significant role in directing learners' attention towards language learning tasks and goals (Dörnyei, 2005). Also, individual differences in cognitive abilities, such as working memory capacity and processing

speed, can impact learners' attentional control during language learning activities (Miyake et al., 2000). External distractions, such as noise and environmental factors, can also affect learners' attention and hinder language learning performance (Sörqvist, 2010).

1.1.6.2 Memory

The process of learning a language is closely linked to memory systems, particularly declarative and procedural memory. The declarative procedural (DP) model posits that the mental lexicon of memorized word-specific knowledge depends on declarative memory, while the grammatical composition of complex forms relies on procedural memory (Ullman, 2004). This model suggests that language learning critically depends on learning and memory systems in the brain (Ullman & Lovelett, 2016).

Furthermore, working memory plays a significant role in language acquisition and processing, with robust and positive relationships reported between working memory and second/foreign language proficiency (Bosman & Janssen, 2017). The role of working memory in language acquisition is emphasized, as it is considered a component of foreign language ability (White, 2020). Moreover, the hypothesis that qualitative differences in the development of phonological representations result in variations in the efficiency of working memory as a key constraint on language learning is supported (Archibald, 2017). The importance of memory in language learning is further underscored by the finding that language learning strategies, including memory strategies, are crucial for successful language acquisition (Sari et al., 2019).

Additionally, the link between language learning and long-term memory is suggested, indicating that learning a new foreign language could increase memory in individuals (Kadia, 2022). Furthermore, the role of memory in language learning is supported by the hypothesis that the phonological loop supports language acquisition by allowing incoming language-

relevant information to be maintained in memory long enough to be processed and transformed into long-term stored knowledge about language (Pierce et al., 2017).

1.1.6.3 Emotion

Research has shown that emotions can have a significant impact on vocabulary learning, text comprehension, and language input awareness (Liu et al., 2018). Emotions also affect language choice in multilingual families, with a greater emotional resonance observed in the native or first-learned language of bilinguals (Dewaele, 2004). Furthermore, positive emotions have been found to enhance awareness of language input, while negative emotions can lead to difficulties and negative experiences in second language learning (Richards, 2020; Wu et al., 2022).

The emotional force of swear words and taboo words has been studied in multilingual speech, highlighting the strong emotional impact of language on individuals (Dewaele, 2004). In addition, emotional factors such as anxiety and enjoyment have been identified as influential in foreign language acquisition and performance (Dewaele&Alfawzan, 2018; Dewaele & Dewaele, 2017). Language anxiety, in particular, has been extensively documented as a significant emotional factor in language learning (Imai, 2010). Positive feelings, such as enjoyment, hope, and pride, have been examined for their role in educational success and second language learning (Yin, 2021).

Moreover, emotional intelligence has been recognized as an important predictor of success in language learning and academic achievement (Balasubramanian& Al-Mahrooqi, 2016; Andrienko et al., 2020). The influence of emotions extends to the learning environment, with emotional support from parents being identified as a crucial factor affecting students' attitudes and motivation in second language learning (Cheng & Zhou, 2023). Furthermore, emotional regulation during language learning environments has been highlighted as an area for further research (Xu, 2022). The whole process of learning a foreign language has been described as

being accompanied by emotions, emphasizing the extensive nature of emotional influence in language learning (Kochmar et al., 2022).

1.1.6.4 Motivation

Motivation plays a crucial role in language learning, influencing learners' choices, actions, and persistence in the learning process (Ushioda, 2012). Motivation can be influenced by various factors, such as attitudes, anxiety, and willingness to communicate (Mohammadian, 2013). Research has shown that comprehensive motivation, which involves a positive attitude towards the target language community, is associated with greater success in language learning (Lukmani, 1972), and learners' motivation is closely linked to their responsibility for their own learning and their perception of the causes of their learning outcomes (Dörnyei, 1998).

Furthermore, motivation is negatively related to foreign language anxiety, and both factors significantly impact students' performance in language learning (Li & Huang, 2011). It has also been suggested that motivation is a key factor in initiating and maintaining the language learning process (Yean et al., 2022). The socio-educational model emphasizes the importance of motivational intensity, desire, and attitudes toward learning the language as significant components of motivation (Gardner et al., 2004). Moreover, the role of motivation in language learning has been explored in various contexts, including online language courses and during the COVID-19 pandemic, highlighting its significance in different learning environments (Ushida, 2013; Dipolog, 2022). Additionally, studies have indicated that highly motivated students with positive attitudes are more successful in language learning compared to those with lower motivation and negative attitudes (Memon et al., 2019). Furthermore, the role of motivation in learning a foreign language has been emphasized, particularly in relation to English as a mandatory subject in foreign language contexts (Riyanti, 2019).

1.1.6.5 Creativity

Creativity is vital in language learning, as it enhances students' ability to use the target language in a meaningful way and enjoy the learning process (Lee, 2019). However, it has been noted that creativity has been under-researched and somewhat ignored in the field of second or foreign language learning (Novikova et al., 2020). Studies have shown that creativity moderately affects participants' output in narrative tasks, indicating its influence on second language acquisition (Albert &Kormos, 2004). According to Wang & Cheng (2016), creativity is influential in second language performance and students' motivation. Language educators generally agree that language education should involve creativity, whether through more creative teaching methods, the use of creative texts, or inspiring students to use language more creatively (Jones, 2019).

Accordingly, experimental studies have demonstrated that both children and adults who speak more than one language have a predominant advantage over their monolingual equivalents in various creativity tests, highlighting the link between multilingualism and creativity (Kharkhurin, 2016). Integrating SMART (Self-directed, Motivated, Adaptive, Resource-enriched, and technology-integrated) education can help foster English language learners' creativity and language development (Huh & Lee, 2019). Digital and interactive technologies are claimed to create a favorable language learning environment that fosters creative and collaborative language learning and writing (Sastre et al., 2022).

Despite potential barriers, developing the creativity of learners has many benefits for learning the language and for developing broader learning objectives, values, and attitudes (Alkhaldi &Taouis, 2020). Teaching creativity is highly recommended as a requirement for every kind of learning, including foreign language learning (Danesh&Nourdad, 2017). Research findings have revealed that learning a foreign language enhances one's creativity,

and the integration of creativity increases students' language skills proficiency (Pardede, 2020). Also, incorporating elements of creativity into English-as-foreign-language education has been shown to promote positive reading attitudes in learners (Chow et al., 2017). The connection between creativity-fostering behaviors of teachers and student motivation in language learning has also been supported (Corsino et al., 2022).

1.2 language acquisition

Language acquisition in children, especially in bilingual contexts, has been the subject of extensive research. Studies have shown that the initial steps in language acquisition are similar in both monolingual and bilingual learning infants, involving the same language areas in the brain (Werker, 2012). Bilingual language acquisition has implications for aspects of acquisition considered to be universal across languages (Paradis & Genesee, 1996). Additionally, developmental sociolinguistics, an interdisciplinary framework, integrates theoretical and methodological contributions from sociolinguistics, language acquisition, speech sciences, developmental psychology, and psycholinguistics, shedding light on children's acquisition of language variation (Johnson & White, 2019).

Furthermore, research has indicated that specific language reduction can impact children's language acquisition, as evidenced by the mean length of utterance in children with specific language impairment compared to younger control children (Rice et al., 2006). Moreover, studies on bilingual signed and spoken language acquisition from birth have shown that children acquiring two languages from an early age present unique mechanisms underlying early bilingual language acquisition (Petitto et al., 2001). Additionally, processes observed in children with autism at similar stages of language development raise the possibility of common, extensive processes central to language acquisition in general (Swensen et al., 2007). Also, research on child language acquisition in spoken African languages has provided

new perspectives in the field of child language acquisition (Edward, 2022). Furthermore, the influence of behaviorist and cognitivist theories in adult language acquisition has been explored, with some researchers suggesting that adults can quickly acquire a second language due to their high level of cognition and strong self-observation skills (Devaki, 2021).

1.2.1 Language acquisition: The Krashen perspective

The theory of second language acquisition proposed by Stephen Krashen has been the subject of extensive research and critical evaluation over the past years. Krashen's Monitor Model, which includes the Input Hypothesis and the Affective Filter Hypothesis, has been a focal point in the field of second language acquisition (SLA) (Lichtman & Van Patten, 2021). The Input Hypothesis posits that language is acquired through comprehensible input, while the Affective Filter Hypothesis emphasizes the role of affective factors, such as motivation and anxiety in language acquisition (Yaoqing, 2021). Krashen's work has been influential in shaping language teaching practices, particularly in emphasizing the importance of providing meaningful and understandable input to language learners (Alolaywi, 2023). However, there have been critical evaluations of Krashen's Monitor Model, with some scholars questioning the empirical validity of his early theoretical work on adult second language acquisition (Jegerski, 2021).

Moreover, there are critiques regarding the lack of specificity and experimental results for some of the key concepts in Krashen's theory, such as the distinction between 'learning' and 'acquisition' (Ayyar, 1988). Some researchers have pointed out that Krashen's hypothesis needs to be interpreted carefully, especially the role of comprehensible input in language acquisition, as the theory might oversimplify the complex processes involved in language learning (Peker & Ozkaynak, 2020). Despite the criticisms, Krashen's theory remains a significant reference point in SLA discussions. The emphasis on providing comprehensible

input and creating a conducive affective environment for language learners remains relevant in language teaching practices (Thach, 2022). Furthermore, Krashen's distinction between language acquisition and language learning continues to influence discussions on the naturalistic approach to language acquisition and the role of formal instruction in language learning (Second Language Acquisition and Learning: Rethinking the Pedagogical Applicability of Stephen Krashen Monitor Model, 2020).

1.2.1.1 The five hypotheses by Stephen Krashen

The five hypotheses proposed by Krashen in his Monitor Model have been widely discussed and evaluated in the field of second language acquisition (SLA). The hypotheses include the Acquisition-Learning Hypothesis, the Monitor Hypothesis, the Natural Order Hypothesis, the Input Hypothesis, and the Affective Filter Hypothesis (Alolaywi, 2023). These hypotheses have been the subject of numerous critical evaluations and experimental studies to assess their contributions to SLA (Lai & Wei, 2019). Krashen's model emphasizes the importance of comprehensible input in language acquisition, suggesting that learners acquire language subconsciously through exposure to meaningful language input (Alahmadi, 2019). This aligns with the Input Hypothesis, which posits that language acquisition occurs when learners are exposed to language that is slightly beyond their current level, leading to gradual improvement in language proficiency (El-dali, 2019).

Furthermore, Krashen's model distinguishes between language acquisition and language learning, suggesting that language acquisition is a subconscious process, while language learning involves conscious knowledge of the language rules (Lichtman&VanPatten, 2021). This distinction is central to the Acquisition-Learning Hypothesis, which emphasizes the primacy of acquisition over learning in achieving fluency in a second language (Farag, 2020). Additionally, the Affective Filter Hypothesis addresses the role of affective factors, such as motivation and anxiety, in language acquisition, suggesting that a low affective filter

facilitates language acquisition, while a high affective filter hinders it (Yaoqing, 2021). While Krashen's Monitor Model has been influential in shaping our understanding of SLA, it has also faced criticism and debate. Some researchers have questioned the exclusive emphasis on comprehensible input in the Input Hypothesis, arguing that other processes, such as language production, should also be considered in language acquisition (Peker & Ozkaynak, 2020).

Moreover, the distinction between language acquisition and language learning has been a topic of contention, with some scholars challenging the duality and advocating for a more integrated approach to language development (Igolkina, 2022). Krashen's theory highlights the significance of meaningful contribution in facilitating language acquisition, suggesting that learners acquire language subconsciously through exposure to comprehensible language content.

1.3 Bloom's taxonomy

Bloom's taxonomy, developed by Benjamin Bloom, provides a systematic approach for educators to design lessons that embrace a range of cognitive abilities essential for linguistic proficiency (Bloom, 1956). By integrating Bloom's taxonomy into language teaching practices, educators can create comprehensive learning experiences that not only emphasize language input but also guide students through a progression of cognitive skills necessary for effective language acquisition and competence (Nurmatova & Altun, 2023). Moreover, Bloom's taxonomy is utilized to outline and organize various stages of human cognition, learning, and comprehension. It adopts a hierarchical structure that arranges learning objectives based on their complexity, ranging from basic knowledge and understanding to advanced levels of assessment and creativity (Horner et al., 2005). This methodology aims to foster higher-order thinking within educational settings by prioritizing the examination and evaluation of concepts, methods, procedures, and principles over rote memorization.

Despite some reservations, Bloom's taxonomy remains prevalent in education and is employed by institutions to enhance their curricula, assessments, and pedagogical approaches. The framework was developed by American psychologist Benjamin Bloom and his team, including Walter Hill, Edward Furst, Max Inglehart, and Kraswall David, who contributed to its classification process (Bloom et al., 1956). Educators employing Bloom's taxonomy seek to cultivate higher-order cognitive skills in students by first developing foundational cognitive abilities. Behavioral and cognitive learning outcomes are cited to demonstrate how Bloom's taxonomy can align with broader educational objectives and policies (Bloom et al., 1956).

A. Knowledge: Recall of information

This constitutes the lowest level of classification, testing whether students have absorbed specific information from lessons. Questions at this level focus on definitions, dates, names, or the main idea conveyed (Cullinane, 2009).

B. Comprehension: Interpretation or extrapolation of knowledge

Comprehension, highly esteemed in educational contexts, goes beyond simple recollection to enable students to make sense of information, interpreting facts in their own terms. For instance, students should not only name cell components but also understand their functions (Cullinane, 2009).

C. Application: Applying knowledge to new situations

Students are required to apply acquired knowledge to solve problems, devise solutions, or illustrate concepts through diagrams (Cullinane, 2009).

D. Analysis: Breaking down knowledge into parts and showing relationships

This level entails discerning patterns within knowledge, breaking down ideas into constituent parts, and elucidating relationships among them. For example, students might analyze the dietary needs of lactose-intolerant individuals (Cullinane, 2009).

E. Synthesis: Integration of knowledge elements to form a whole

Students are tasked with utilizing existing knowledge to develop new theories or predictions, combining insights from diverse subjects. For instance, inventing new products or games necessitates synthesizing novel ideas (Cullinane, 2009).

F. Evaluation: Judging the value of material and methods

Considered the pinnacle of cognitive thinking, evaluation involves assessing information for its worth, strengths, weaknesses, and relevance to specific purposes. Students are prompted to critically evaluate information, often employing terms like "selected," "judged," "discussed," or "recommended" (Cullinane, 2009).

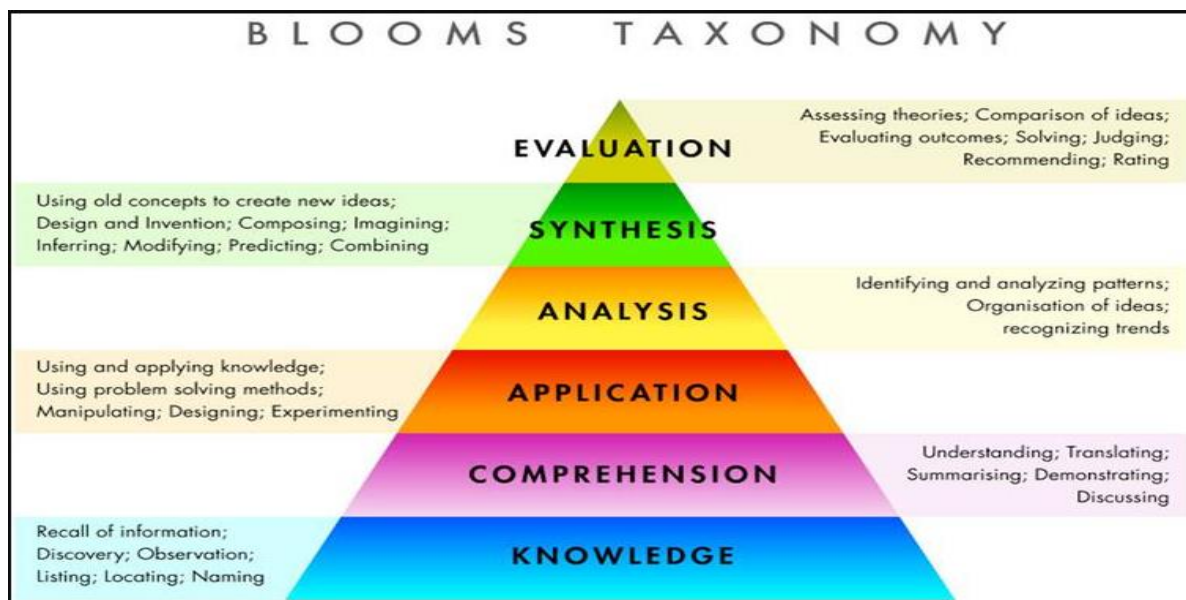


Figure1. Bloom's taxonomy from a longer piece on the taxonomy of Bloom (2017)

1.3.1 The Role of Bloom's taxonomy

Bloom's taxonomy, developed by Benjamin Bloom in 1956, has been widely used in education to classify educational objectives and define the cognitive processes necessary for learning. It provides a hierarchical structure that categorizes thinking abilities from basic information acquisition to more complex processes (Jaiswal & Al-Hattami, 2020). The taxonomy differentiates between cognitive skill levels and emphasizes learning objectives that require higher levels of cognitive skills, leading to deeper learning and the transfer of knowledge and skills to a greater variety of tasks and contexts (Adams, 2015). It has been applied in various fields, such as music education, biology, and strategic management, to align learning objectives, curriculum, and assessment and to enhance student learning (Nkhoma et al., 2017; Crowe et al., 2008; Albert & Grzeda, 2014).

Furthermore, Bloom's taxonomy has been integrated into learning activities to develop scientific literacy, creative thinking skills, and problem-solving abilities (Pujawan et al., 2022; Wiranata et al., 2021). It has also been used to organize questions at higher cognitive levels, aiding in the assessment of students' cognitive abilities and the development of their coding competence (Susantini et al., 2021; Баранова et al., 2019; Rahayu, 2018). Additionally, the taxonomy has been utilized in blended learning to create a clear structure, vision, and learning process parameters for course development (Pikhart & Klimova, 2019; Abdullah & Noori, 2021). Moreover, Bloom's taxonomy has been instrumental in enhancing learners' academic performance through student-centered approaches and has influenced the teaching and assessment of learning objectives for interpreter education programs (Landa & Clark, 2018; Parwata et al., 2023). It has also been used to analyze and formulate strategies, emphasizing the need to develop classroom processes that encourage critical thinking and reflection (Albert & Grzeda, 2014). The taxonomy has been revised over the past years to enhance its

applicability in various educational settings (Krathwohl, 2002). Implementing Bloom's Taxonomy has been shown to enhance student learning in various fields, including biology, where it has been integrated into course subject matter and assessment strategies, leading to improved learning outcomes (Crowe et al., 2008).

Accordingly, studies have utilized Bloom's taxonomy in designing learning outcomes, incorporating engaging learning activities, and assessing academic performances, demonstrating its effectiveness in enhancing learners' cognitive abilities (Jaiswal & Al-Hattami, 2020; Ringo et al., 2020). In the context of mathematics education, Bloom's taxonomy has been combined with cognitive domains to develop high-order thinking skill problems, indicating its flexibility across different disciplines (Ariyanto et al., 2020). Additionally, the taxonomy presents cognitive development as the achievement of higher-order abilities, reflecting the progression from lower-level to higher-level skills (Nayef et al., 2013).

1.3.2 The Educational objectives of Bloom's taxonomy

Bloom's Taxonomy of Educational Objectives, developed by Benjamin Bloom in the 1950s, provides a hierarchical classification system for thinking abilities, from basic information acquisition to more complex processes (Jaiswal & Al-Hattami, 2020). This taxonomy has become widely influential in K–16 educations, serving as a useful tool to identify cognitive processing levels of objectives and assessments, irrespective of assessment type (Momsen et al., 2010). The revised Bloom's taxonomy has been applied to various fields, including music education, providing a framework for aligning learning objectives, curriculum, and assessment (Nkhoma et al., 2017). It has also been used to develop assessment tools such as the Blooming Biology Tool (BBT), which assists science faculty in aligning assessments with teaching activities and helps students enhance their study skills and metacognition (Crowe et al., 2008).

Furthermore, the taxonomy makes it easier for teachers to define learning objectives, thus making students aware of what they are learning and focused on achieving learning objectives (Susantini et al., 2021). In the context of clinical surgery, applying higher levels of Bloom's taxonomy is aimed at developing higher-order thinking skills in education (Tuma&Nassar, 2021). Additionally, Bloom's taxonomy has been widely used in pedagogy to create a clear structure, vision, and learning process parameters for building and developing courses (Pikhart&Klimova, 2019). Bloom's Taxonomy is a commonly used tool in educational research for assessing the cognitive level of course assignments and exams. However, it has not been widely applied as an analytical tool in the anatomical sciences. To address this gap, researchers developed the Blooming Anatomy Tool (BAT) based on previous studies. (Thompson & O'Loughlin, 2014). The taxonomy has been widely cited and influential in curriculum development, student and teacher assessment, and the accreditation of educational institutions, offering a scheme for classifying educational goals, objectives, and standards (Panthalookaran, 2021). It has been used as a framework for categorizing the goals of education, curriculum, and test preparation worldwide (Rahayu, 2018).

Essentially, Bloom's Taxonomy educational objective is to provide a framework for classifying educational goals and objectives into a hierarchical structure representing levels of learning, from basic information acquisition to more complex processes (Jaiswal & Al-Hattami, 2020), and determine the congruence of educational objectives, activities, and assessments in a unit, course, and curriculum (Nayef et al., 2013). Bloom's taxonomy has been widely used in curriculum development, student and teacher assessments, and accreditation of institutions, and providing education by offering a scheme for classifying educational goals, objectives, and standards (Krathwohl ,2002).

On the whole, the taxonomy framework used in education, through the lens of Bloom, Anderson, and the SOLO framework, plays a crucial role in aligning learning objectives,

curriculum, and assessment (Aripin et al., 2020); it assists science faculty in better aligning their assessments with their teaching activities and helps students enhance their study skills and metacognition (Crowe et al., 2008). Bloom's taxonomy has been applied in various contexts, including undergraduate biology education, where it has been used to classify the cognitive skills targeted by introductory biology courses and to characterize exams (Freeman et al., 2011; Momsen et al., 2010). Additionally, it has been utilized as a discipline-specific rubric for designing and evaluating assessments in the anatomical sciences (Thompson & O'Loughlin, 2014); it has been used to evaluate the cognitive level of assessments and inform course design and to measure expert skills (Semsar & Casagrand, 2017).

1.3.3 Domains of Bloom's taxonomy

Developed by Benjamin Bloom and his colleagues, this taxonomy provides educators and instructional designers with a structured approach to articulate and target specific levels of cognitive, affective, and psychomotor development in learners. The taxonomy consists of three primary domains: The Cognitive Domain, which focuses on intellectual skills and thinking processes; the Affective Domain, which addresses the emotional and attitudinal aspects of learning; and the Psychomotor Domain, which pertains to the development of physical or motor skills. Understanding these domains and their associated levels of learning can greatly assist in designing effective instructional strategies and assessments that facilitate holistic learning experiences.

A. The Cognitive domain

The cognitive domain of Bloom's taxonomy encompasses various aspects of cognitive function, including memory, attention, executive function, and language. Research has shown that cognitive disability can manifest across different cognitive domains, such as verbal memory, working memory, executive functions, attention, and visuospatial abilities

(Pankowski et al., 2022). In the context of specific conditions like bipolar disorder, distinct cognitive profiles have been identified, with some individuals exhibiting selective flaws in verbal memory, while others may show incapacity across all cognitive domains (Tsapekos et al., 2020).

Furthermore, studies have highlighted the association between cognitive decline and various health factors, such as sleeping patterns, mental well-being, and hospitalization, affecting multiple cognitive domains, including memory, visuospatial abilities, language, and executive function (Wu et al., 2020; Sprung et al., 2020). Additionally, the impact of cerebral small vessel disease on cognitive performance has been observed across global cognition and specific cognitive domains (Li et al., 2021). Moreover, cognitive impairment has been studied in the context of specific medical conditions, such as psoriasis, anorexia nervosa, and schizophrenia, with findings indicating irregularities in multiple cognitive domains, including working memory processes, verbal memory, and social cognition (Tamiya et al., 2018; Victoria et al., 2019).

Besides, research has demonstrated the relevance of cognitive domains in predicting disease-specific outcomes, such as gait characteristics predicting decline in specific cognitive domains in Parkinson's disease (Morris et al., 2017). The MARTICS consensus cognitive Battery is a tool used in neuropsychology to measure different cognitive abilities in a standardized way. It helps identify specific areas of cognitive function, like memory, attention, problem-solving, and more; this provides a comprehensive way to evaluate someone's overall cognitive performance and identify any strengths or weaknesses (Kern et al., 2008). Additionally, studies have utilized cognitive domain-specific assessments to evaluate cognitive function in various populations, such as children with drug-resistant epilepsy and adolescents with schizophrenia, highlighting the importance of assessing cognitive outcomes across multiple domains (Puka & Smith, 2021).

B. The Affective domain

The affective domain of Bloom's taxonomy encompasses the emotional and social aspects of learning, focusing on attitudes, values, and emotions. It is an essential component of education, alongside the cognitive and psychomotor domains (Dorji&Yangzom, 2021). Bloom and Krathwol categorized the affective domain, emphasizing the development of student attitudes and values (Shephard, 2008). The affective domain is crucial for understanding educational goals and evaluating student performance (Dorji&Yangzom, 2021). It is often overlooked in comparison to the cognitive domain despite its significance in shaping students' social and emotional competencies (Durlak et al., 2011). The affective domain is deeply rooted in educational objectives and is distinct from the cognitive domain, as acknowledged by Bloom and Masia's taxonomies (O'Regan, 2019). The affective domain is essential for developing students' emotional intelligence and social and emotional learning (Nathanson et al., 2016). It is also associated with the development of "soft skills" necessary for practice, as highlighted in engineering education (Camelia & Ferris, 2017).

Furthermore, the affective domain is crucial in physical therapy education, as it embodies the knowledge, skills, and attitudes requiring competence in the affective domain (Berg-Carramusa et al., 2023). Assessment of the affective domain is a significant area of research, with studies focusing on affective assessment methods, affective learning models, and the influence of affective domains on mastery of material (Khaerudin et al., 2020). The affective domain is also impacted by external factors, such as the COVID-19 pandemic, which has affected the three learning domains, including the affective domain (Anandapadmanabhan et al., 2022). In the context of education, the affective domain is interconnected with attitudes, beliefs, and values, as noted in various studies (Hyland, 2014). It is also crucial for educators to explore the emotional relationships that educators

have with pupils and each other (Alvarez-Hevia, 2017). Additionally, the affective domain is relevant in music education, where it is one of the learning domains alongside the cognitive and psychomotor domains (Kafol et al., 2015)

C. The Psychomotor domain

The psychomotor domain of Bloom's taxonomy encompasses the development of physical and motor skills involving voluntary movements in response to stimuli (Nicholls et al., 2014). This domain is crucial in various fields, such as agriculture, medicine, engineering, and nursing, as it contributes to the enhancement of practical skills and clinical competence (Njura et al., 2020; Salyers, 2007; Isa et al., 2020). Furthermore, the development of psychomotor skills is interconnected with cognitive and affective domains, emphasizing the importance of a comprehensive approach to learning (Ghufron et al., 2023; Dubrowski et al., 2021). In the context of education, the integration of psychomotor skills into learning management systems and the use of simulation-based training have been recognized as valuable approaches to support the acquisition of these skills (Shahriari-Rad et al., 2017; Eroğlu et al., 2022).

Additionally, the COVID-19 pandemic has prompted the evaluation of distance education's impact on psychomotor skill development, highlighting the significance of early assessments to enhance students' clinical success (Higgins et al., 2020). Moreover, using multimedia tools and virtual haptic simulators has shown promise in supporting the development of clinical psychomotor skills, particularly in medical and dental education (Thoirs & Coffee, 2012; Skinner et al., 2018). These technological advancements offer new opportunities for enhancing psychomotor skill acquisition, especially in complex task domains such as robotic-assisted surgery. In summary, the psychomotor domain of Bloom's taxonomy plays a vital role in skills development across various disciplines, and

its integration into educational practices, including the use of technology and distance learning, is essential for fostering the acquisition of psychomotor skills.

1.4 Conclusion

In conclusion, this chapter presented the interdisciplinary field of neuroscience and its significant impact on education, particularly in the context of language acquisition. The chapter provided an overview of the history of neuroscience and its relevance to education, highlighting the fundamental concepts and implications for learning and language acquisition. Then, it delved into examining the cognitive mechanisms involved in learning a language. The last part of the chapter provided an in-depth analysis of Bloom's Taxonomy, its relevance to educational practices, and its application in the context of Algerian English language education. By understanding the cognitive, affective, and psychomotor domains of Bloom's Taxonomy, educators can develop more effective and targeted language learning strategies that cater to the diverse needs of Algerian students learning English. Overall, this chapter aims to provide a comprehensive overview of the relationship between neuroscience, language acquisition, and education, with a specific focus on the context of Algerian English language education.

Chapter Two: Research methodology

2. Introduction

The primary focus of the second chapter revolves around the practical aspect of the study. It aims to gather data on the integration of Bloom's taxonomy into the Algerian primary schools. Also, it investigates the development of the cognitive neuroscience of young English learners. This chapter discusses the methodology used to develop our research questions and validate the accuracy or inaccuracy of our hypothesis. Moreover, the current chapter describes the participants' profiles and the tools used to reach accurate results: a questionnaire with primary school teachers, a classroom observation with two different levels, and finally, an interview with two medical teachers.

2.1. Research design

Research design is crucial to any study, providing a systematic plan to address a scientific problem (Indu, 2020). It ensures that the evidence obtained enables us to cover and address the research problem as effectively, logically, and clearly as possible. Obtaining information relevant to a research problem requires determining what evidence is needed to verify and validate hypotheses (Vaus, 2001). It should be tailored to the specific research question and hypothesis, with a clear plan for data collection, measurement, and analysis (Indu, 2020).

Controlling variance is also essential in research design (Dulock, 1993). The choice of design could impact the validity of the research, with certain designs being better suited to establishing causality (Mikeal, 1980). Due to the originality of the research topic, which highlights the integration of Bloom's Taxonomy in Algerian Primary Schools to study the development of young English learners from a cognitive neuroscience perspective, researchers opted for both inductive and deductive research requiring more exploration, flexibility, and a focus on qualitative observational analysis and statistics for data evidence, which requires quantitative reinforcement to develop leading questions properly.

2.2. Research Method

Because integrating Bloom's taxonomy into Algerian primary schools to study young English learners' development from a cognitive neuroscience perspective is a new topic in the Algerian context, the researchers opted for inductive and deductive research, combining quantitative and qualitative methods, also called a mixed-methods approach. The latter allows us to provide readers with a deeper understanding of the topic because it is flexible in addressing a broader range of research questions and considers a variety of skills when building a research team (Abowitz & Toole, 2010). For more accuracy, we employed three tools: a questionnaire, an interview, and an observation to investigate whether Algerian primary school teachers at Derdour Belkacem and Abdelhamid Ibn Badis primary schools use the most effective methods and strategies for teaching English at a young age, especially Bloom's taxonomy and its impact on the cognitive process of 3rd-grade and 4th-grade pupils.

To develop our research questions, we went deeply through the research steps. We initiated the study by collecting data from a teachers' questionnaire, pupils' observation, and a medical teachers' interview to obtain the appropriate results to help us explain the relationship between Bloom's taxonomy and the cognitive neuroscience development of young Algerian learners.

2.3. Context

Before we conducted our research study in Derdour Belkacem and Abdelhamid Ibn Badis primary schools, with two different school levels, third and fourth, we obtained permission from the two school directors to access the classrooms to observe and question our participants. Also, we explained our research objectives and methodology to the involved participants to guarantee their rights and confidentiality without any ethical issues. The motivation for this study came from identifying gaps in English teaching methods. Since Algeria recently introduced English in primary schools, we realized this research topic would greatly benefit.

2.4. Procedure

During the second semester, we conducted a three-week experiment with 3rd-grade and 4th-grade pupils at Derdour Belkacem and Abdelhamid Ibn Badis primary schools. Before and after the experiment, we observed the students for eight sessions to gather more information. We also gave a questionnaire to 15 primary school teachers, both in-person and online. Lastly, we interviewed two medical teachers within a week to obtain more results regarding the second part of our research, "a cognitive neuroscience perspective," the core topic. Their contribution helped us develop our research questions and conduct our study flexibly.

2.5. The sample profile

The sample is a subset of the population being studied. Data from the sample are used to make inferences concerning the population of interest. A sample profile is a list of characteristics and attributes of a set of sample individuals on which some measurements are to be made (Will Kenton,2022). Typically, a profile will be used to identify suitable individuals to participate in the study. Profiles may be essential inclusion criteria or simply a set of desirable attributes. Profiles are often used to sample from within a larger group of individuals. Moreover, a sample profile helps researchers understand the characteristics of the participants and provides context for the study's findings (Shaheen et al., 2019).

Furthermore, in academic literature, the definition of a sample profile can vary depending on the discipline and the specific research methodology being employed. It is important to note that the construction of a sample profile should be guided by ethical considerations, ensuring that the privacy and confidentiality of the participants are protected. In our case, the study is based on a sample of fifteen primary school teachers in different areas of Mostaganem, Algeria, as well as eight classroom observations across various grade levels in both Derdour Belkacem and Abdelhamid Ibn Badis primary schools in Mostaganem, Algeria. Additionally,

an Email interview was conducted with an Algerian neurocognitive researcher who offered valuable insights.

2.5.1. The teacher's profile

The teacher profile consists of a group of fifteen individuals who belong to various primary schools in Mostaganem. Each teacher possesses a valid English licence, indicating their proficiency in the language. Their teaching experience varies between two and fifteen years.

2.5.2. The medical teachers' profile

The informants are two medical teachers. The first is a speech-language pathologist and a neurocognitive researcher who works as a university lecturer at the University of Oran and Algiers, Algeria. She has 8 years of experience in her field. The second medical teacher is a neurologist who also works as a university lecturer in the medical department at the University of Mostaganem, Algeria. She has 16 years of experience in her field.

2.5.3. The students' profile

There are a total of eight classes between Derdour Belkacem and Ibn Badis primary schools. These classes consist of pupils from two different grade levels: third and fourth. The age range of these pupils typically falls between seven and nine years old.

2.6. Data collection instruments

To gather relevant data for our research study, we employed an in-person questionnaire, an online questionnaire, an in-person interview, an online interview, and classroom observations. The online questionnaire served as a research tool conducted and delivered via the Internet, allowing us to gather both qualitative and quantitative data from the participants.

2.6.1. Questionnaire

A questionnaire is a valuable tool for gathering data and measuring various constructs. The development and use of questionnaires are essential in different fields, such as psychology, medicine, and education. Moreover, a questionnaire is simply a tool for collecting and recording information about a particular issue of interest. It is mainly made up of a list of questions but should also include clear instructions and space to record answers. The term "questionnaire" indicates that data is collected through asking questions.

According to Bhandari (2023), a questionnaire is a list of questions or items used to gather data from respondents about their attitudes, experiences, or opinions. The questionnaire can be used to collect quantitative and/ or qualitative information. Questionnaires come in various forms, either qualitative or quantitative, and can be administered through online platforms, over the phone, on paper, or in person. It is not always essential for a researcher to be present during the completion. These surveys typically include open-ended or closed questions and sometimes a combination of both. Open-ended questions allow respondents to freely express their thoughts in their own words, while closed questions offer a set of predetermined response options for respondents to choose from.

2.6.2. The teachers' questionnaire

The questionnaire was distributed to teachers in person during classroom observations and online using the Google Forms application. The online questionnaire was created and conducted digitally. For information, out of the 27 teachers approached, 15 agreed to participate, providing us with valuable information to answer our research questions.

2.6.3. Description of the teacher' questionnaire

The questionnaire starts with one general question about personal information, including teachers' years of teaching experience and the school name where they are employed. The following questions delve into familiarity with Bloom's taxonomy, its implementation, and frequency of use in lesson planning and instructional practices. The questionnaire further

explores the benefits and potential enhancements of integrating Bloom's taxonomy into teaching English to young learners, along with challenges faced during implementation. It also investigates techniques to inspire higher-order thinking abilities in students, how Bloom's taxonomy is used to measure progress and enhance cognitive skills, personalization of Bloom's taxonomy levels to meet individual learner needs, observed improvements in student engagement and motivation, necessary professional development for effective incorporation of Bloom's taxonomy into lessons, and recommendations for further research on its role in the cognitive neuroscience development of young Algerian learners in primary schools.

2.6.4. Interview

The second tool employed in this research was the interview, which involves a formal conversation between two or more individuals, where one person asks the questions and the other person provides answers or information (engo academy,2023). Interviews are commonly used in research studies to gather information, assess qualifications or skills, make decisions, or get to know the interviewee better. Interviews are crucial in research studies because they provide detailed information about participants' beliefs, perspectives, and experiences. Furthermore, in today's digital age, the traditional in-person interview is no longer the only option for gathering qualitative data. Email interviews have emerged as a powerful alternative, offering unique advantages and making them an increasingly popular choice for researchers. An email interview refers to a method of conducting an interview using email as the primary form of communication between the interviewer and interviewee, i.e., instead of interviewing someone over the phone or via video conference, the questions and responses are exchanged through emails. According to Bampton & Cowton (2002) and Opendakke (2006), email interviews can be used for the following reasons: the researcher does not depend on social interaction; the budget for travel is limited, so the research targets a group that is hard to reach or has limited access and anonymity would be helpful.

2.6.5. The teachers' interview

We interviewed our first medical teacher, a neurologist, in person at her office, and the second medical teacher, due to her unavailability, online via email. There were nine open-ended interview questions.

2.6.6. Description of the teachers' interview

As said, the interview questions were open-ended. The first two questions explore memory's role and the close connection between attention and language learning from a neuroscience perspective; they delve into how our brains process linguistic information and the importance of focusing on words, phrases, and grammar structures for effective language acquisition. Furthermore, questions Three and Four examine the significance of motivation, emotion, and the challenges young learners face in cognitive development, particularly in language acquisition. They highlight the impact of these factors on the learning process and the obstacles that learners encounter in their language-learning journey. Moreover, questions five and six consider how insights from cognitive neuroscience can enhance teaching methods. They aim to improve language learning outcomes by leveraging neuroscience-informed strategies and evidence-based approaches.

The last three questions, Seven, Eight, and Nine explore collaboration opportunities between teachers, policymakers, and neurologists and recommend effective integration of cognitive neuroscience principles into teaching practices. They also discuss the contribution of Bloom's Taxonomy levels to the cognitive development of young learners, particularly in language acquisition. These questions aim to enhance language learning programs through evidence-based strategies, informed collaboration, and tailored instructional practices aligned with cognitive neuroscience insights.

2.6.7. Observation

Classroom observation is a valuable research tool that provides insights into teacher practices, students' behavior, and classroom environment. It allows for the collection of data on instructional practices, classroom management, and student engagement (Bellibas,2022). While self-report research is appropriate, there is a need to expand research to examine teachers' self-reported efficacy with other methods, such as classroom observation of teachers' classroom practices (Alibakhshi et al., 2020).

Additionally, the development of observation tools through participatory action research has led to the creation of validated assessment tools designed to measure the social climate of classrooms (Skaalvik, E. M et al., 2022). Classroom observation has served various interests, from pedagogical research, curriculum development, course evaluation, and peer review to the appraisal of teaching and the professional development of educators.

2.7.8. Classroom observation

A total of eight classroom observations were conducted in two primary schools, Derdour Belkacem and Abdelhamid Ibn Badis. These observations aimed to assess whether the teachers in the 3rd-grade and 4th-grade classes integrate Bloom's taxonomy into their teaching methods. The focus was on examining whether the application of Bloom's taxonomy in instruction effectively promotes the cognitive development of young learners, taking into consideration the principles of cognitive neuroscience.

After collecting data using various tools and gathering the necessary information for the research, it is crucial to analyze the data collected. This process is known as the data analysis procedure. It involves organizing and synthesizing the data to achieve research results and draw conclusions. Researchers typically employ a combination of quantitative and qualitative methods to measure and analyze the gathered data. This section will provide a detailed overview of each method used in the analysis.

➤ Quantitative analysis

It is essential to follow a systematic approach to conducting quantitative analysis to ensure the accuracy and reliability of the results. One common method used in quantitative analysis is statistical analysis, which involves collecting, organizing, and interpreting numerical data to uncover patterns, trends, and relationships within the data.

To begin a quantitative analysis, the researchers must first define the research questions or hypotheses to be used. This step is crucial as it helps to focus on the data collection statistical methods to be used (Javeed Kittur,2023). Then, they start working on analyzing numerical data collected through surveys, experiments, or other data collection methods. It is important to ensure that the data collected is accurate, reliable, and representative of the population being studied.

Our study was designed to investigate the specific research questions concerning the impact of neuroscience on language learning and the integration of Bloom's Taxonomy within educational settings, employing a quantitative analysis framework. With a focus on exploring how Bloom's Taxonomy contributes to the cognitive development of young Algerian English learners in primary schools, we conducted an online questionnaire distributed to 15 primary school teachers to gather quantitative data on teachers' perceptions of examining whether the application of Bloom's taxonomy in instruction effectively promotes the cognitive development of young learners, taking into consideration the principles of cognitive neuroscience, such as reading think-pair-share activities and intensive training.

➤ **Qualitative analysis**

Qualitative analysis is a research method used to understand and interpret social phenomena by examining non-numerical data such as texts, images, videos, and observations. This approach allows researchers to explore complex social issues, attitudes, behaviors, and experiences in depth. Qualitative analysis involves systematic procedures for coding, categorizing, and interpreting data to identify patterns, themes, and relationships. One key

reference for qualitative analysis is "Qualitative Inquiry and Research Design: Choosing among Five Approaches" by (John W. Creswell, 2012). This book provides a comprehensive overview of different qualitative research approaches, including narrative research, grounded theory, and case studies. Creswell discusses the philosophical underpinning of qualitative research, data collection methods, data analysis techniques, and strategies for ensuring rigor and trustworthiness in qualitative studies.

Our study aimed to explore the influence of neuroscience on language learning and the application of Bloom's Taxonomy in educational settings. To gather data, we conducted a qualitative analysis using an online interview with two medical teachers who are experienced researchers in various aspects of language learning and cognitive development from a neuroscience perspective. The interview consisted of nine open-ended questions covering topics such as the role of memory and attention in language learning, challenges faced by young learners, the application of cognitive neuroscience insights to teaching methods, collaboration opportunities between educators and neurologists, and the contribution of Bloom's Taxonomy to cognitive development in language acquisition. Overall, the interview sought to inform language learning programs and instructional practices by exploring the intersection of neuroscience and education. Simultaneously, the qualitative classroom observations were conducted in eight classes, with four observations in 4th-grade classrooms and four in 3rd classrooms, to examine the application of Bloom's Taxonomy in educational settings and its impact on students' cognitive development. These observations involved systematically observing student engagement with educational approaches aligned with Bloom's Taxonomy levels and, most importantly, seeing if Bloom's taxonomy is really integrated among the other teaching methods. This approach provided numerical insights into the implementation of Bloom's Taxonomy and its effects on student learning outcomes.

2.9. Research study limitations

This section examines the limitations and challenges encountered during the research study. First, our research approach is primarily interpretivist, relying on interviews and classroom observation to gather qualitative data. However, we also had to employ an online questionnaire to collect quantitative data. Second, a notable difficulty arose from the teachers' lack of cooperation in responding to the questionnaire. Only 15 out of 27 teachers agreed to participate after persistent efforts. Their hesitance came from either a lack of familiarity with Bloom's taxonomy or a complete unfamiliarity with the concept. Third, it proved time-consuming to find a willing neurocognitive researcher to collaborate with us despite encountering numerous professionals who declined collaboration without any form of compensation. Regardless of these limitations, we managed to reduce its effects on our research process, and we found some EFL teachers and medical teachers who eagerly participated in this study.

2.10. Conclusion

This chapter delved into the methodology employed in our study, outlining the research purpose and motivation behind our chosen topic. Additionally, it offers insights into the research design, profiles of participants (The teachers, the students, and the doctor), data collection tools, and analysis procedures, including methods utilized for data analysis. The next chapter will analyze the collected data using the two previously discussed analysis methods.

Chapter Three: Results and discussion

3. Introduction

This chapter displays the main findings regarding the integration of Bloom's taxonomy into the Algerian primary schools. It also discovers the development of young learners from the neurocognitive standpoint. It discusses the analysis and interpretation of the data collected, addressing our research questions and validating our hypotheses. The chapter also presents suggestions and recommendations for effectively incorporating Bloom's Taxonomy into primary school curricula.

3.1. Data analysis

This section examines the data collected from the teachers' questionnaire, the medical teachers' email interview, and the classroom observation.

3.1.1. The analysis of the teachers' questionnaire

The questionnaire was directed to primary school teachers; fifteen teachers out of twenty-seven agreed to participate and provide their responses. The purpose of the questionnaire was to investigate the role of Bloom's taxonomy in developing the neurocognitive of young Algerian English learners in primary schools.

A- The first section was about personal information:

The questionnaire gathered responses from teachers across 15 primary schools located in Mostaganem, Algeria. These schools include Derdour Belkacem, Abdelhamid Ibn Badis. The participating teachers have a varied range of teaching experience, ranging from 1 year to 14 years. This diversity in experience provides valuable perspectives for our research analysis.

B- The second section talks about the implementation of Bloom's taxonomy in Algerian primary schools.

Question 01: Have you ever heard of Bloom's taxonomy? If so, how frequently do you use it in your lessons?

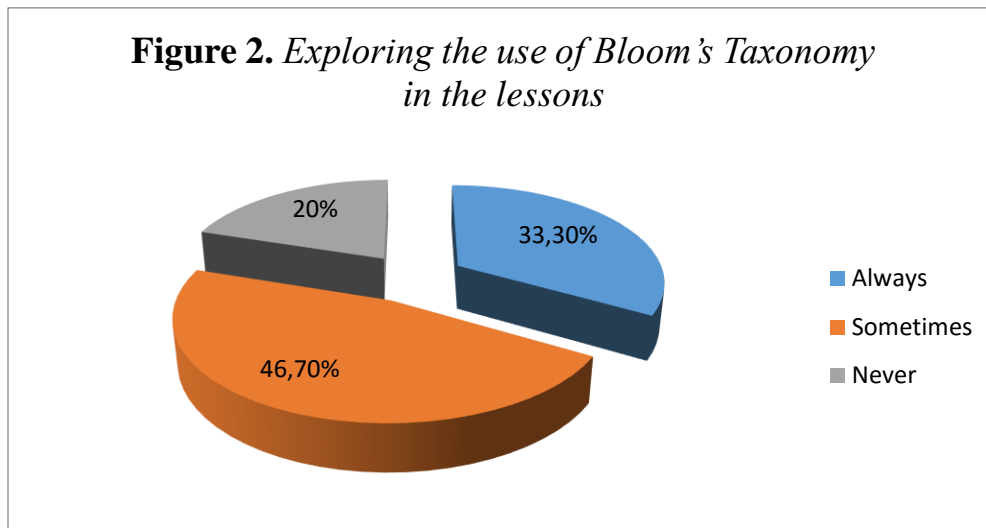
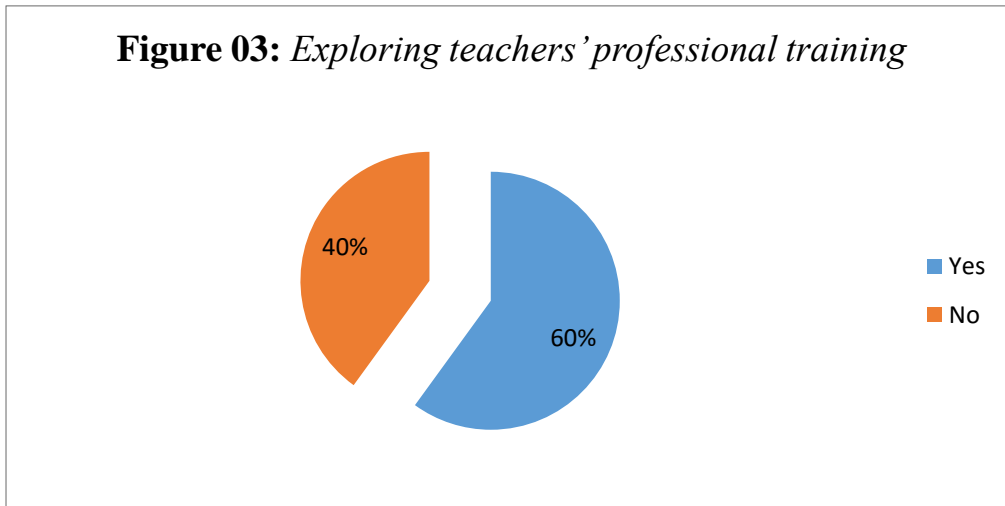


Figure2. *Exploring the use of Bloom's Taxonomy in the lessons*

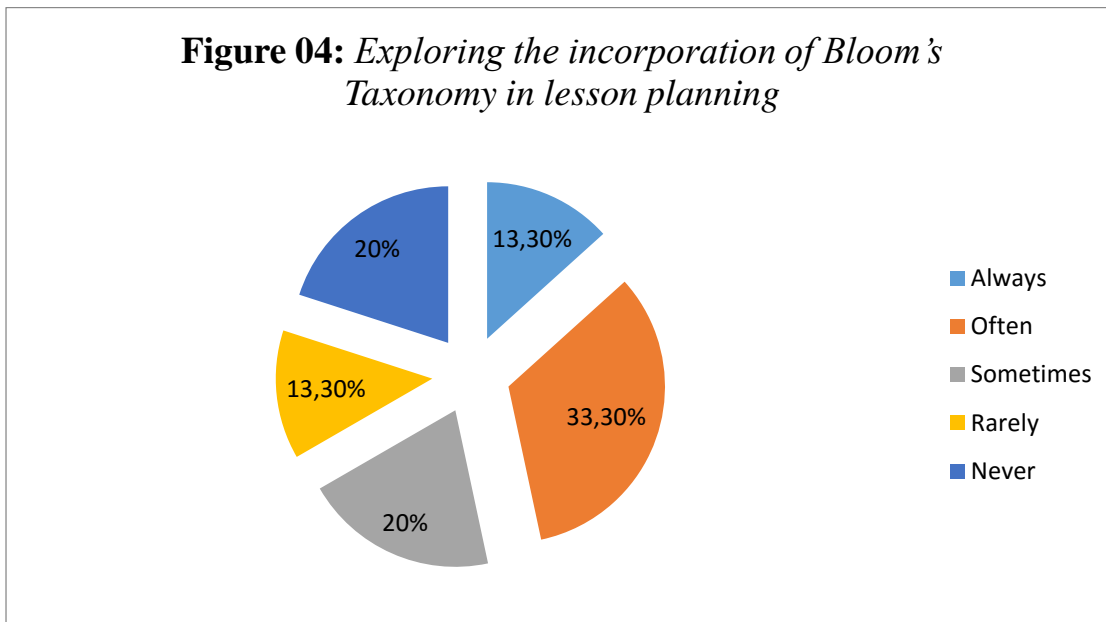
Figure 2 shows that 20% of the teachers, that's 3 out of 15 total teachers, never use Bloom's taxonomy in their lessons. These teachers are from the Salah Mouloud, Elbachir Hammou, and Ourida Meded primary schools. Additionally, 33,3% of the teachers, or 5 out of 15, always use Bloom's Taxonomy. These are the schools where Bloom's Taxonomy is always used: Derdour Belkacem, Abdelhamid Ibn Badis, Ibn Zaydoun, Keneche Mohamed, Mokhtar Mohamed, Berahel Ahmed, and Kara Mustapha. The remaining 46,7% of the teachers, which is 7 out of 15, use Bloom's Taxonomy sometimes or occasionally. These are the schools where it is used sometimes: Mouloud Faraoun, Salah Mouloud, Benkarda, Ourida Meded, Azza Ahmed, Benhammadi Ahmed, and Latroch Khdim.

Question 02: Have you received any training or professional development related to Bloom's Taxonomy implementation in the classroom?

Figure 03: *Exploring teachers' professional training***Figure 03:** *Exploring teachers' professional training*

The Figure above illustrates the professional training of the teachers. Sixty percent (60%) reported having received training, while the remaining 40% indicated they had not received any training.

Question 03: How often do you incorporate Bloom's taxonomy into lesson planning and instructional practices?

Figure 04: *Exploring the incorporation of Bloom's Taxonomy in lesson planning***Figure 04:** *Exploring the incorporation of Bloom's Taxonomy in lesson planning*

The figure above shows that 13,3% (2 teachers) always integrate Bloom's Taxonomy into their lesson planning. A larger portion, 33,3% (5 teachers), reported that they often include it in their lessons. Meanwhile, 20% (3 teachers) indicate that they sometimes use Bloom's Taxonomy. An equal percentage of 13,3 (2 teachers) said they rarely incorporate it, and another 20% (3 teachers) admitted that they never use Bloom's Taxonomy in their instructional practices.

Question 04: what are the benefits of using Bloom's taxonomy in teaching English to young learners?

The responses highlighted several benefits of utilizing Bloom's Taxonomy when teaching English to young learners. Over 75% of the respondents noted that Bloom's taxonomy provides a structured framework for lesson planning, allowing teachers to design activities that target a range of cognitive levels, from basic recall to higher-order skills like analysis and evaluation. Approximately 50% of responses also emphasized that Bloom's Taxonomy values setting clear learning outcomes, enhancing students' cognitive development and creativity, and promoting engagement and motivation. However, around 15% of respondents indicated they were unfamiliar with Bloom's Taxonomy and did not see the value in following its guidelines.

Question 05: A- Have you faced any challenges or difficulties when implementing Bloom's taxonomy in your lessons?

Figure 05: *Exploring the challenges and difficulties of implementing Bloom's Taxonomy*

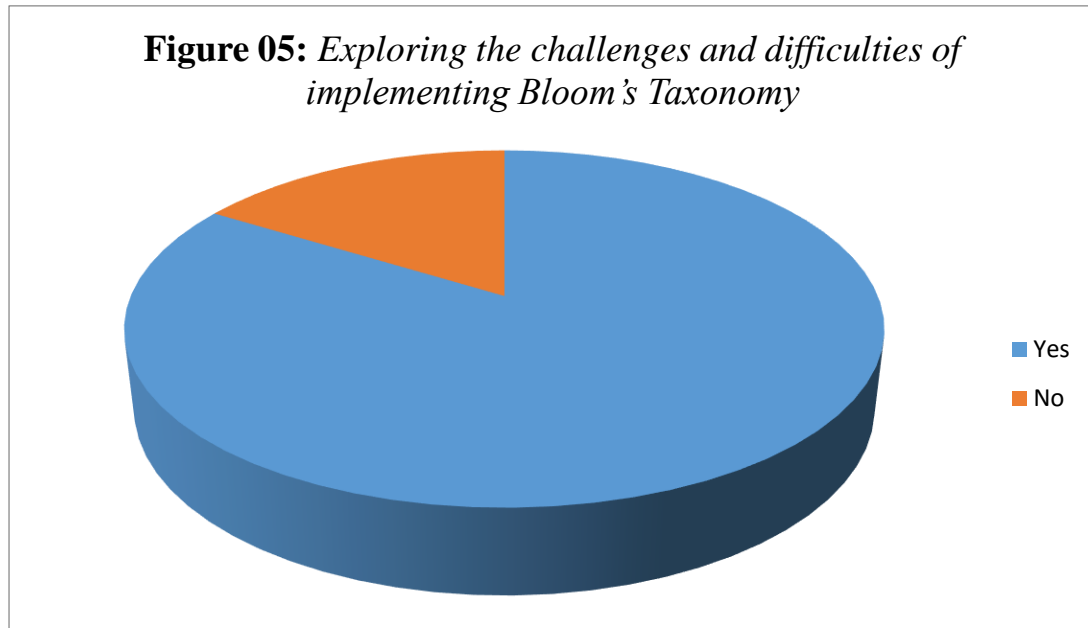


Figure 05: *Exploring the challenges and difficulties of implementing Bloom's Taxonomy*

Figure 05 shows that 86,7% (13 teachers) faced challenges and difficulties when implementing Bloom's Taxonomy. The remaining 13,3% (2 teachers) have not faced any challenges.

B- if yes, please describe the challenges or difficulties you faced.

The responses highlight several common challenges encountered when trying to fully implement Bloom's taxonomy in the English classroom for young learners. The most frequently cited issue, noted by over 45% of respondents, was the difficulty in designing instructional activities that effectively target each cognitive level, from basic recall to higher-order skills of analysis, evaluation, and creation. The teachers found it challenging to meet the varied needs and language abilities of their students while also trying to design activities that aligned with the different levels of the Taxonomy. Additionally, around 30% of responses mentioned that it is struggling to reach the highest levels of the Taxonomy, such as creation, within the constraints of a single course. Other challenges included students' lack of understanding of the cognitive steps involved. Several respondents, around 15%, expressed

feeling untrained or unfamiliar with how to properly apply Bloom's Taxonomy, leading to difficulties in transitioning smoothly between activities targeting different levels.

Question 06: In your opinion, how could Bloom's taxonomy, if integrated into teaching methods, enhance the neuroscience development of young learners?

The responses suggest that incorporating Bloom's Taxonomy into teaching approaches could have a positive impact on the neuroscientific development of young learners in several ways. Over 60% of respondents mentioned how the Taxonomy's emphasis on progressively building cognitive skills, from lower to higher-order thinking like evaluation and creation, can help stimulate and reinforce neural pathways associated with learning, memory, and critical thinking. Additionally, around 45% of responses indicated that Bloom's Taxonomy can foster greater self-awareness, emotional intelligence, and the ability to produce knowledge among young learners.

Question 07: What methods and techniques do you adopt to inspire your students to develop higher-order thinking abilities?

The responses suggest a variety of engaging, student-centered instructional approaches that teachers can utilize to foster higher-order thinking skills. Significant methods mentioned by over 50% of respondents include incorporating inquiry-based learning, where students are encouraged to ask questions and collaboratively solve problems or scenarios. Additionally, around 40% of responses highlighted the value of project-based learning, allowing students to work together in pairs or groups to complete more complex activities. Many teachers also emphasized the importance of incorporating authentic materials such as audiovisual resources, videos, songs, and realia to capture interest and engagement. Approximately 35% of respondents agreed on technology integration, games, and feedback. Other approaches mentioned included using direct questioning to facilitate classroom discussions.

Question 08: How do you use Bloom's taxonomy to measure your student's progress and help them improve their cognitive skills and achieve their academic goals?

Around 35% of respondents indicated that they intentionally align their lesson objectives and activities with different levels of Bloom's taxonomy. This allows them to scaffold instruction and support students in progressively developing more advanced cognitive abilities, from simple recall to higher-order skills. Approximately 25% of responses highlighted the use of formative assessments, such as quizzes, short answers, and class discussions, to track students' progress at the various cognitive levels outlined in Bloom's taxonomy. A smaller number of respondents, around 15%, mentioned establishing clear learning objectives rooted in Bloom's Taxonomy and then providing targeted feedback to students to help them improve. However, it's important to note that nearly 30% of responses indicated that teachers either do not use Bloom's Taxonomy at all or feel they lack the knowledge and experience to effectively implement it in their teaching practice.

Question 09: Have you tried changing Bloom's taxonomy levels to better meet the individual needs of your learners? If so, describe what it would be like.

Many teachers have experienced modifying or adapting Bloom's Taxonomy to address the student's needs and abilities better. Approximately 50% of respondents indicated that they have tried using a variety of approaches. Some have found success in a more flexible and personalized approach. For example, they prefer starting with a stronger focus on lower-level skills like remembering and understanding before introducing more complex cognitive processes. Around 25% of teachers have selectively skipped certain taxonomy levels, such as analysis, which can be particularly challenging for young learners. A smaller number, around 15%, have even omitted the evaluation stage, believing it may limit the creativity and imagination of the learners. However, not all teachers favor this adaptation; about 25% of respondents explained that exposing students to the full hierarchy of cognitive levels outlined

in Bloom's Taxonomy was crucial to their development, rather than picking or choosing which levels to include.

Question 10: Have you noticed any significant improvement in your student's engagement and motivation levels ever since you began incorporating Bloom's taxonomy into your lessons?

The majority of teachers, around 75%, reported significant improvements in their pupils' engagement and motivation levels after incorporating Bloom's Taxonomy into their lessons. The most commonly cited benefits included are increased student confidence and self-efficacy as they develop their cognitive skills through the activities, higher levels of focus and involvement in the lessons, better understanding of the content with fewer difficulties, and a greater sense of accomplishment and motivation. Around 15% of respondents either did not use Bloom's Taxonomy or could not identify any improvement, while one teacher noted that students "seem happier" after implementing Bloom's Taxonomy.

Question 11: What specific professional development or training do teachers need to effectively incorporate Bloom's taxonomy into their lessons?

Approximately (85%) of the responses indicated that teachers require practical, straightforward strategies and techniques for designing learning objectives, activities, and assessments that are aligned with the different cognitive levels of Bloom's Taxonomy. Around 75% of the responses also emphasized the need for a deep understanding of Bloom's Taxonomy framework, including its purpose and proper classroom application. Fifty percent (50%) of the answers suggested the importance of training on developing a variety of assessments that target different cognitive levels, while (35%) recommended collaborative learning opportunities, such as workshops and seminars led by experienced teachers.

Question 12: What are your suggestions for using Bloom's Taxonomy to study young learners' English language processing from a neurocognitive perspective in primary school?

Approximately (67%) of the responses suggested conducting more research that explains and emphasizes the importance of Bloom's Taxonomy in developing the cognitive neuroscience of young Algerian learners while also providing teachers with guidelines and training on effectively employing this framework. Moreover, (33%) of the responses recommended carrying out comparative studies between Algerian primary schools that incorporate Bloom's Taxonomy-based instruction and those that do not.

3.1.2. The Interpretation of the questionnaire.

The study of 15 primary school teachers in Mostaganem, Algeria, reveals diverse practices toward the use of Bloom's Taxonomy. While some teachers consistently use this framework, others do irregularly or not at all. This difference is mainly because some have received training while others have not. Most teachers find Bloom's Taxonomy helpful for planning lessons and improving students' levels. Teachers highlighted the importance of practical strategies and further training to enhance the effective implementation of Bloom's Taxonomy. The majority reported positive impacts on students' engagement and motivation, emphasizing the need for ongoing research and professional development.

3.1.3 The Analysis of the medical teachers' interview

This section will analyze the responses from the two medical teachers the researchers formally interviewed to obtain valuable data.

Question 01: A clear understanding of memory's role in language acquisition is essential for the learner who wishes to master a new language from a neuroscience perspective; exploring how our brain processes and stores linguistic information is fascinating. Based on your experience, could you please provide us with an explanation of the role of memory in language learning?

Both medical teachers explained that having a strong memory is essential for successfully learning a new language. They described the different types of memory involved in language

learning as working memory, which holds on to new words and grammar for processing; implicit memory, which subconsciously absorbs grammar through exposure; semantic memory, which stores words' meaning; and episodic memory, which remembers specific examples of using the language in real life situations. The medical teachers also emphasized that long-term memory is especially crucial. They said that repeatedly practicing and reviewing what you have learned is the key to getting new language information to stick in the long-term memory. The more you repeat and reinforce the language, the better you will be able to remember and use it over the long term.

Question 02: It is essential to focus and pay close attention to the words, phrases, and grammar structures used to learn a language effectively. In your opinion, what is the close connection between attention and language learning?

The two medical teachers said that paying attention is really important for helping learners remember what they are learning in a new language. They explained that attention is like a gatekeeper for the brain; it decides what information the brain focuses on and tries to remember. One medical teacher said that getting the learners' attention is necessary to help them remember new language information first. She said they can do this by doing something unexpected or different to "break the ice" and get their focus. Then, they should present the information in a creative, engaging way.

Question 03: Motivation and emotional factors are crucial in optimizing the learning process. Could you please discuss these factors in language learning from a neuroscience perspective?

Both medical teachers explained that from a neuroscience point of view, motivation and emotion significantly impact language learning. They confirmed that our brain's reward system releases a chemical called dopamine when we are motivated; this makes the learning process feel good, which encourages us to keep practicing and trying hard. Positive emotions like excitement can also improve our ability to remember what we are learning. The

neurologist explained that negative emotions can make it harder to learn. Emotions like anxiety and fear of failure can cause distractions and make it harder to pay attention or to stock any information.

Question 04: In your experience, what are the main challenges and difficulties that young learners face regarding cognitive development?

The neurology specialist emphasized that many young people are not getting enough good quality sleep with complete sleep cycles, which can be very beneficial for developing thinking and learning abilities. Additionally, the specialist noted that some young learners may not engage enough in reading, which is important for building imagination and memory skills. The second doctor (medical teacher) discussed how technology devices, like phones and tablets, can impact the attention span of young learners. She said that using these devices can make it difficult for them to concentrate on complex topics for an extended period of time.

Question 05: Cognitive neuroscience provides a deeper understanding of how the brain processes information, which can help us create better teaching methods for young learners. According to you, how could this understanding help improve teaching methods for young learners?

Both specialists agreed that cognitive neuroscience provides valuable insights for developing more effective teaching for young learners. The first medical teacher (neurology specialist) emphasized that in order to improve teaching, educators must know their behaviors, needs, likes, and dislikes and then adapts their methods accordingly. The second doctor discussed how understanding the workings of memory in young minds allows teachers to update techniques like repetition to build long-term memory. Additionally, she noted that by recognizing young learners' limited attention spans, teachers can design lessons with shorter, focused activities and incorporate movement breaks to keep students engaged.

Question 06: Are there any specific research studies that show the impact of cognitive neuroscience-based teaching methods on young learners?

One of the medical teachers said they did not have any specific research studies to recommend. However, the other medical teacher explained that while cognitive neuroscience does offer some potential for improving teaching methods, it is still an emerging field. Some research has shown promise in areas like memory and attention, but other studies did not find a clear advantage over traditional teaching approaches. Furthermore, she noted that teaching training seems to be a key factor. When educators understand the cognitive aspects of how students learn, they can better adapt their teaching approaches to be more effective.

Question 07: How can teachers and policymakers collaborate with neurologists to improve language learning programs?

Both respondents declared that neurologists can help train teachers better. Neurologists can train teachers more about how the brain works when young people are learning a language, which can make the teachers more effective. The medical teachers also said that research on the brain and its development can help design school curricula that better fit how young students learn and grow. However, one respondent said that before the teachers and neurologists meet with policymakers, they should first meet with the young learners to know what they need and want best.

Question 08: Could you provide any specific recommendations for teachers to integrate principles of cognitive neuroscience into their teaching effectively?

Both medical teachers agreed that teachers can improve their classrooms for learning language by using ideas from brain science. They claimed that to help learners remember important lessons, teachers should help them practice a little bit at a time, over and over. Teachers can also use lots different ways for students to learn, like visuals sounds, and

physical movement. Also, teachers should use fun activities like games, simulations, role playing. This can make learning language enjoyable and effective for the students.

Question 09: From a cognitive neuroscience perspective, how do different levels of Bloom's Taxonomy contribute to the overall cognitive development of young Algerian learners, particularly in relation to language acquisition?

The respondents explained that Bloom's Taxonomy outlines different cognitive skill levels, which are all important for effective language learning. At the most basic level, there is remembering and understanding, which lays the foundation by helping learners memorize vocabulary words and grammatical rules. As learners progress, they start to apply that knowledge in new contexts and analyze how language works, building fluency and linguistic awareness. At the highest levels, learners engage in evaluating and creating, thinking critically about language use, and producing their own language, which integrates all the lower-level skills. The taxonomy provides a helpful framework for designing learning activities that engage learners' minds at multiple cognitive levels, facilitating robust language learning and supporting cognitive development.

3.1.4 The Interpretation of the Medical teachers' interview

The study involves doctors' insights on neurocognitive development in young Algerian learners of English and highlights several key points. Strong memory, especially long-term memory, is strengthened through repeated practice. Attention is crucial to learning, as it helps focus on and remember new information; creative methods can help capture and maintain this attention. Motivation and positive emotions enhance learning by activating the brain's reward system, while negative emotions can diminish it. Challenges for young learners include insufficient sleep, limited reading, and distractions from technology, which can shorten attention spans. Understanding cognitive neuroscience can improve teaching methods, such as using more repetition, multi-sensory activities, and engaging approaches. Collaboration

between teachers, policymakers, and neurologists is suggested to enhance language learning programs. Additionally, Bloom's Taxonomy provides a useful framework for developing cognitive skills, from basic to advanced levels, aiding in the design of effective learning activities.

3.1.5 The analysis of the classroom observation

As mentioned in the previous chapter, eight classroom observations were conducted at two primary schools: Derdour Belkacem and Abdelhamid Ibn Badis. These observations aimed to evaluate the integration of Bloom's taxonomy by teachers in 3rd and 4th-grade classes.

We could observe the main phases that helped us complete our analysis and validate our hypotheses. These phases are as follows:

a- Observing the learning environment

During our observation of the classroom, we noticed that the comfort of the classroom is available in terms of organization to emotionally support young learners in their first learning steps. The classrooms were a well-structured and purposeful arrangement of instructional elements. For example, all the classes had paintings with alphabets and numbers, and some of them even had animal paintings. We also noticed that the classroom environment promoted a sense of psychological safety. Pupils felt comfortable making mistakes and asking for help without fear of embarrassment. Moreover, the teacher fostered a supportive and inclusive environment, encouraging students to express their ideas and opinions without hesitation.

b- Pupils' observation

We noticed that participation, engagement, motivation, and critical thinking require more consideration and updates to improve teaching methods.

- **Participation:** The learners participated in the revision of the previous lessons and other activities. However, they did not engage in discussions or ask questions related to the lesson.
- **Engagement:** Although the pupils were engaged in the activities, the teachers had difficulty managing the classroom. The pupils were moving around, being loud, and hard to control.
- **Motivation:** The pupils showed motivation in the classroom and actively participated with the teachers. However, they encountered challenges in understanding the teacher's instructions and comprehending the activities.
- **Critical thinking:** The pupils were divided into two categories. The first category consisted of intelligent and engaged learners who showed signs of critical thinking. The second category of students did not lack participation and completion of activities. However, their creativity and critical thinking skills were somewhat limited compared to the first category.

c- Observing the implementation of Bloom's taxonomy in the classroom

During the classroom observation, we noted that both teachers we observed were familiar with Bloom's taxonomy and made efforts to incorporate it into their lessons. However, we observed that in both 3rd and 4th-grade classrooms, the teachers encountered difficulties in effectively utilizing all the six levels of Bloom's taxonomy. They incorporated the first three levels (knowledge, comprehension, and applying). Another point is that the teachers were only familiar with the revised taxonomy; they had no idea about the original one. Though they attempted to engage pupils in critical thinking and problem-solving activities, these activities primarily focused on lower-order thinking skills. The majority of the time was spent on tasks that required recalling information, comprehending concepts, and applying basic knowledge.

As a result, opportunities for students to engage in deeper analysis, synthesis, and evaluation were limited.

3.1.6 The interpretation of the classroom observation

During our observation in 3rd-grade and 4th-grade classrooms at two primary schools, we gained insights into the learning environments, the use of Bloom's Taxonomy, and pupil behaviors. The classrooms were well-organized, supportive, and inclusive, fostering active student participation. Although teachers incorporated Bloom's Taxonomy principles, they mainly focused on the first three levels, remembering, understanding, and applying—due to time constraints and lesson duration. Teachers noted that the full impact of Bloom's Taxonomy might become more evident by the end of the academic year. Pupils displayed varying levels of engagement and critical thinking, with some showing high intelligence and familiarity with English, while others needed more support to enhance their cognitive development and creativity.

3.2 Discussion of the findings

The analysis of the teachers' questionnaire revealed considerable variation in the usage of Bloom's Taxonomy among teachers. While some teachers reported never using it, others consistently applied it, and many used it occasionally. This inconsistency can be attributed to different levels of professional training received, highlighting a gap in professional development. When integrating Bloom's Taxonomy into lesson planning, practices also varied. Some teachers always incorporated it, others often included it, some used it occasionally, a few rarely integrated it, and some never used it. Despite these differences, a significant majority recognized the benefits of Bloom's Taxonomy. They valued its structured framework for lesson planning and its ability to help design activities targeting different cognitive levels, from basic recall to higher-order skills like analysis and evaluation. Several

teachers emphasized its value in setting clear learning outcomes and enhancing students' cognitive development and creativity. However, a few were unfamiliar with the framework and did not see its value. Implementing Bloom's Taxonomy also presented challenges. Many teachers found it difficult to design activities for each cognitive level; some struggled to reach the highest levels, such as creation within a single course, and a few felt untrained or unfamiliar with the Taxonomy. Despite these challenges, many observed positive impacts on students' neurocognitive development. Several teachers noted that progressively building cognitive skills helps stimulate brain connections, and some mentioned that it fosters greater self-awareness, emotional intelligence, and the ability to produce knowledge. Teachers highlighted various student-centered instructional approaches.

Some mentioned incorporating inquiry-based learning, others valued project-based learning, and several emphasized the use of authentic materials like videos and realia, as well as technology integration and games. In terms of adaptation, about half of the teachers modified Bloom's Taxonomy to better suit their students' needs. Some focused on lower-level skills before introducing more complex levels, and a few selectively skipped some levels. However, some believed in exposing students to the full hierarchy of cognitive levels. Most teachers reported significant student engagement and motivation improvements after incorporating Bloom's Taxonomy. They observed benefits such as increased student confidence, better focus, and a greater sense of accomplishment, although a few did not notice any improvements. For effective implementation, many teachers expressed the need for practical strategies and techniques to design learning objectives and assessments aligned with Bloom's Taxonomy. Additionally, several teachers stressed the importance of a deep understanding of the framework, and many highlighted the need for training in developing various assessments. Collaborative learning opportunities, such as workshops and seminars, were also recommended. Lastly, the majority of teachers suggested that further research and

comparative studies are necessary to highlight the impact of Bloom's Taxonomy on student development and to establish best practices for its application in diverse educational contexts.

On the other hand, the medical teachers involved in our study emphasized the crucial role played by memory in this process, clarifying various memory types such as working memory, implicit memory, semantic memory, and episodic memory. They particularly emphasized the significance of long-term memory, asserting that repeated practice and review are essential for incorporating new language information into the brain. Furthermore, the doctors (medical teachers) elaborated on the relation between attention and language learning, showing attention as the guardian of cognitive resources, deciding what information is stored and remembered. They promoted strategies to capture learners' attention, such as utilizing unexpected or creative approaches to engage them effectively. Motivation and emotion were recognized as important factors that affect how learning happens. The doctors explained how positive emotions, such as excitement, facilitate memory retention and learning, while negative emotions, like anxiety, can impact focus and diminish comprehension. They highlighted the need for educators to foster a supportive and motivating learning environment to optimize students' language learning outcomes. In addition to psychological factors, the doctors addressed practical challenges young learners face, including insufficient sleep and technological distractions, which can weaken learning effectiveness by compromising attention and cognitive function.

Moreover, the doctors stressed the importance of integrating insights from cognitive neuroscience into pedagogical practices. They advocated for tailored teaching approaches that align with learners' cognitive capacities, suggesting strategies such as incorporating repetition to enhance long-term memory formation. Collaboration among educators, policymakers, and neurologists was proposed as a means to advance language learning programs. By utilizing insights from neuroscience, educators can perfect teaching methodologies to better meet the

needs of diverse learners. Furthermore, the doctors praised Bloom's Taxonomy as a valuable framework for guiding cognitive development in language learning, offering a systematic approach that progresses from foundational skills to higher-order thinking abilities, thus enabling educators to design activities that engage learners across multiple cognitive levels effectively.

Transitioning from the description of our observations in primary school classrooms to the discussion of our findings, it is evident that the learning environments we encountered were suitable for effective learning. The availability of relevant resources and materials facilitated student engagement, while the positive psychological and emotional atmosphere fostered a sense of inclusivity and motivated participation among students. Despite teachers' familiarity with Bloom's Taxonomy, our observations revealed a dominant focus on the first three levels of the taxonomy, remembering, understanding, and applying, due to various factors, including time limitations. This limited the exploration of higher-order thinking skills and posed a challenge to the comprehensive application of Bloom's Taxonomy in classroom instruction.

Furthermore, our discussions with teachers highlighted the potential delayed visibility of Bloom's Taxonomy outcomes, with a highlight on the slow but steady improvement in thinking abilities expected by the end of the school year. Therefore, conducting a comprehensive study at the conclusion of the academic year was proposed to understand better the impact of Bloom's Taxonomy implementation on students' cognitive development. Lastly, our observations of students revealed varying levels of participation, engagement, motivation, and critical thinking skills. While some students demonstrated high intelligence and active engagement, showing a good understanding of lesson topics, others presented limited creativity and cognitive development, indicating the need for targeted support to enhance their critical thinking skills and progression through Bloom's Taxonomy levels.

3.3. Suggestions and recommendations

Bloom's Taxonomy is a useful framework for learning and thinking. Our study explores how this framework could be applied in Algerian primary schools to help understand how young students' brains develop when learning English as a new language. By looking at students' cognitive skills through Bloom's Taxonomy, educators may be able to tailor their teaching methods better to support students' neurological growth and language acquisition. Based on what was said and discussed, our suggestions are as follows:

We should provide extensive and ongoing training programs for teachers on applying Bloom's Taxonomy based on the following:

- Workshops will be held to teach creative ways of designing activities for each level Bloom's Taxonomy.
- Organizing workshops by experts in cognitive neuroscience and educational psychology.
- Longer classroom sessions to give teachers enough time to cover all the levels of Bloom's Taxonomy; this will allow students to do more critical thinking and creative activities.
- Encouraging collaboration between teachers, neuroscientists, and policymakers to design a curriculum based on insights from cognitive neuroscience; this could lead to more effective teaching strategies and improve students' learning.
- We should employ a neuroscientist alongside the school psychologist in educational settings like primary, middle, and high schools. The psychologist will monitor the students' psychological development, while the neuroscientist will follow the students' cognitive development, ensuring that students get all the support they need to improve their learning.

Finally, it is crucial to provide the classrooms with a variety of technological devices to improve learning outcomes. We are dealing with a generation of digital natives, students who

grew up immersed in technology from a very young age. To truly engage and connect with these students, we need to speak their language, and their language is technology.

3.4. Conclusion

This chapter aimed to analyze and interpret the data collected from classroom observations, teachers' questionnaires, and interviews with medical doctors. The findings indicated that integrating Bloom's Taxonomy in Algerian primary schools is essential for enhancing the neurocognitive development of young English learners. However, implementation varies due to inconsistent professional training, with most teachers focusing on lower cognitive levels. Despite this, many teachers recognize the benefits of Bloom's Taxonomy, such as improved cognitive development and students' engagement. Additionally, incorporating neurologists and psychologists in schools could provide tailored support for students' cognitive and emotional development. Further research and training are recommended to optimize Bloom's Taxonomy's impact.

General Conclusion

Our study explored the implementation of Bloom's Taxonomy and its effect on neurocognitive development among young English learners based on three main questions that focused on the effectiveness of integrating Bloom's Taxonomy into Algerian primary schools in preparing English language lesson plans, the impact of this framework on the cognitive development of young English learners, and how the integration of neuroscience principles could enhance the neurocognitive development of these learners.

From gathered comprehensive data on the current practices and perceptions of Bloom's Taxonomy in primary schools, Derdour Belkacem and Abdelhamid Ibn Badis primary schools, with 15 primary school teachers and two medical teachers at the faculty of medicine at Abdelhamid Ibnbadis University, the findings indicated that when Bloom's Taxonomy is appropriately applied, it enhances memory retention, attention, and critical thinking among students. Through classroom observations, teacher questionnaires, and interviews with medical teachers, the results revealed that Bloom's Taxonomy provides a structured framework for lesson planning and enhances cognitive development, but its application needs to be more consistent among teachers due to the lack of training and limited class durations. Teachers who received training on Bloom's Taxonomy were more involved in its incorporation and applied it in their lessons, while those who needed more training did not use it in their lessons. The limited duration of lessons, typically 45 minutes per session, also made it difficult to apply Bloom's Taxonomy fully.

Furthermore, the study highlighted the significant role of memory, attention, motivation, and emotion in language learning. Medical teachers emphasized the importance of long-term memory and the need for repeated practice and review to reinforce new information. They also emphasized that attention decides what information gets remembered and stored. The

emotional and motivational aspects were also crucial. Positive emotions and motivation would make learning easier, while negative emotions like anxiety could diminish it.

Based on these findings, the study recommends increasing the integration of Bloom's Taxonomy in primary education, encouraging teachers to be trained to integrate it effectively into their teaching practices, and providing them with the necessary skills and strategies. Moreover, incorporating neurologists and psychologists into educational institutions can offer valuable insights into students' cognitive and emotional development, leading to more effective teaching methods. Neurologists can provide training on how the brain functions during language learning, while psychologists can monitor and support students' psychological development.

Overall, this study confirms the importance of integrating Bloom's taxonomy, including cognitive neuroscience. It could be useful for educators, policymakers, and researchers interested in enhancing language learning and cognitive development in primary education.

References

- Abdullah, A. A., & Noori, B. S. M. A. (2021). Using of linguistic aspects of Bloom's Taxonomy in blended learning. *International Journal of Research in Science and Technology(Online)/International Journal of Research in Science and Technology*, 11(1).<https://doi.org/10.37648/ijrst.v11i01.003>
- Abowitz, D. A., & Toole, T. M. (2010). Mixed Method Research: Fundamental Issues of Design, Validity, and Reliability in Construction Research. *Journal of Construction Engineering and Management*, 136(1), 108-116. [https://doi.org/10.1061/\(asce\)co.1943-7862.0000026](https://doi.org/10.1061/(asce)co.1943-7862.0000026)
- Academy, E., & Academy, E. (2023, août 18). Research Interviews: An effective and insightful way of data collection. *Enago Academy*. <https://www.enago.com/academy/research-interviews/>
- Adams, N. E. (2015). Bloom's taxonomy of cognitive learning objectives. *Journal of The Medical Library Association*, 103(3), 152-153. <https://doi.org/10.3163/1536-5050.103.3.010>
- Alahmadi, N. S. (2019). The Role of Input in Second Language Acquisition: An Overview of Four Theories. *Bulletin of Advanced English Studies*, 3(2). <https://doi.org/10.31559/baes2019.3.2.1>
- Albert, Á., & Kormos, J. (2004). Creativity and Narrative Task Performance: An Exploratory Study. *Language Learning*, 54(2), 277-310. <https://doi.org/10.1111/j.1467-9922.2004.00256.x>
- Albert, S., & Grzeda, M. (2014). Reflection in Strategic Management Education. *Journal of Management Education*, 39(5), 650-669. <https://doi.org/10.1177/1052562914564872>
- Ali, K. A. G., Khalil, H. E. M., & El-Sharkawy, F. M. (2020). Impact of Online Remote Education on the Learning Process among Nursing Students. *Open Journal of Nursing*, 10(09), 810-830.<https://doi.org/10.4236/ojn.2020.109057>
- Alibakhshi, G., Nikdel, F., & Labbafi, A. (2020). Exploring the consequences of teachers' self-efficacy: a case of teachers of English as a foreign language. *Asian-Pacific Journal of Second and Foreign Language Education*, 5(1).<https://doi.org/10.1186/s40862-020-00102-1>

- Alkhaldi, A. A., & Taouis, H. B. (2020). Creative Use of Second Language Theories and Creative Language Learning: Some Considerations. *Universal Journal of Educational Research*, 8(12B), 8536-8543. <https://doi.org/10.13189/ujer.2020.082664>
- Alolaywi, Y. (2023a). Learning English from Movies: An Exploratory Study. *International Journal of Social Science and Human Research*, 06(04). <https://doi.org/10.47191/ijsshr/v6-i4-43>
- Alvarez-Hevia, D. M. (2017). The Emotional Learning of Educators Working in Alternative Provision. *Educational Studies: /Educational Studies*, 54(3), 303-318. <https://doi.org/10.1080/00131946.2017.1356307>
- Anandapadmanabhan, L. T., Ramani, P., Ramadoss, R., Panneerselvam, S., & Sundar, S. (2022a). Effect of COVID-19 on Dental Education: A Review. *Curēus*. <https://doi.org/10.7759/cureus.24455>
- Andrienko, T., Chumak, N., & Genin, V. (2020). Emotional intelligence and acquisition of english language oral communication skills. *Novitnâ Osvîta*, 7(15), 66-73. <https://doi.org/10.20535/2410-8286.201013>
- Appendix B: Taxonomy of educational objectives (Bloom 1956; Krathwohl, Bloom and Masia 1964). (2009). AAHE-ERIC/Higher Education Research Report, 3(1), 59-60. <https://doi.org/10.1002/aehe.3640030109>
- Arbuckle, M. R., Travis, M. J., Eisen, J., Wang, A., Walker, A. E., Cooper, J. J., Neeley, L., Zisook, S., Cowley, D. S., & Ross, D. A. (2019a). Transforming Psychiatry from the Classroom to the Clinic: Lessons from the National Neuroscience Curriculum Initiative. *Academic Psychiatry*, 44(1), 29-36. <https://doi.org/10.1007/s40596-019-01119-6>
- Archibald, L. M. D. (2017). Considering the (separable) influences of phonological sensitivity and working memory on language learning outcomes. *Applied Psycholinguistics*, 38(6), 1301-1304. <https://doi.org/10.1017/s0142716417000248>

- Aripin, M. A., Hamzah, R., Setya, P., Hisham, M. H. M., & Ishar, M. I. M. (2020). Unveiling a new taxonomy in education field. *International Journal of Evaluation and Research In Education*, 9(3), 524. <https://doi.org/10.11591/ijere.v9i3.20458>
- Ayyar, I. (1988). Second-language learning. *World Englishes*, 7(3), 349-353. <https://doi.org/10.1111/j.1467-971x.1988.tb00249.x>
- Balasubramanian, C., & Al-Mahrooqi, R. (2016). Emotional Intelligence in Language Instruction in Oman: The Missing Link? *RELC Journal*, 47(2), 145-160. <https://doi.org/10.1177/0033688216645471>
- Bampton, R., & Cowton, C. J. (2002). The E-Interview. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 3(2), 1-12. <https://doi.org/10.17169/fqs-3.2.848>
- Bellen, H. J., Tong, C., & Tsuda, H. (2010). 100 years of Drosophila research and its impact on vertebrate neuroscience: a history lesson for the future. *Nature Reviews. Neuroscience*, 11(7), 514-522. <https://doi.org/10.1038/nrn2839>
- Benjamin, S. (2013). Educating psychiatry residents in neuropsychiatry and neuroscience. *International Review of Psychiatry*, 25(3), 265-275. <https://doi.org/10.3109/09540261.2013.786689>
- Benjamin, S., Widge, A., & Shaw, K. (2014). Neuropsychiatry and Neuroscience Milestones for General Psychiatry Trainees. *Academic Psychiatry*, 38(3), 275-282. <https://doi.org/10.1007/s40596-014-0112-0>
- Benson, P. (2007). Autonomy in language teaching and learning. *Language Teaching*, 40(1), 21-40. <https://doi.org/10.1017/s0261444806003958>
- Berg-Carramusa, C. A., Mucha, M. D., Somers, K., & Piemonte, N. (2023). The Time Is Now: Leveraging the Affective Domain in PT Education and Clinical Practice. *Journal, Physical*

Therapy Education/Journal of Physical Therapy Education, 37(2), 102-107.<https://doi.org/10.1097/jte.0000000000000271>

Bhandari, P. (2023). A questionnaire is a list of questions or items used to gather data from respondents about their attitudes, experiences, or opinions. *Scribbr*.
<https://www.scribbr.com/methodology/questionnaire/>

Bloom, B.S., et al. (1956) A Taxonomy of Educational Objectives Handbook I The Cognitive Domain. Longman, Green Co., New York. - References - Scientific Research Publishing. (s. d.).<https://www.scirp.org/reference/referencespapers?referenceid=2124075>

Bosman, A. M. T., & Janssen, M. (2017). Differential relationships between language skills and working memory in Turkish–Dutch and Native-Dutch first-graders from low-income families. *Reading & Writing*, 30(9), 1945-1964.<https://doi.org/10.1007/s11145-017-9760-2>

Bowers, J. S. (2016). The practical and principled problems with educational neuroscience. *Psychological Review*, 123(5), 600-612. <https://doi.org/10.1037/rev0000025>

Bozkuş, K. (2021). A Systematic Review of Studies on Classroom Management from 1980 to 2019. *International Electronic Journal of Elementary Education*, 13(4), 433-441.<https://doi.org/10.26822/iejee.2021.202>

Burke, K. (2019). The challenges of facilitating arts learning in home education. *British Educational Research Journal*, 45(5), 961-978. <https://doi.org/10.1002/berj.3546>

Camelia, F., & Ferris, T. L. J. (2017). Undergraduate Students' Engagement with Systems Thinking: Results of a Survey Study. *IEEE Transactions On Systems, Man, And Cybernetics. Systems*, 47(12), 3165-3176. <https://doi.org/10.1109/tsmc.2016.2563386>

Carrillo, C., & Flores, M. A. (2020). COVID-19 and teacher education: a literature review of online teaching and learning practices. *European Journal of Teacher Education*, 43(4), 466-487.
<https://doi.org/10.1080/02619768.2020.1821184>

- Cenoz, J. (2011). The influence of bilingualism on third language acquisition: Focus on multilingualism. *Language Teaching*, 46(1), 71-86.
<https://doi.org/10.1017/s0261444811000218>
- Cheng, X., & Zhou, S. (2023). The influence mechanism of parental emotional companionship on children's second language acquisition. *Frontiers In Psychology*, 13.
<https://doi.org/10.3389/fpsyg.2022.1034867>
- Chiao, J. Y., Cheon, B. K., Pornpattanakul, N., Mrazek, A. J., & Blizinsky, K. D. (2013). Cultural Neuroscience: Progress and Promise. *Psychological Inquiry*, 24(1), 1-19.
<https://doi.org/10.1080/1047840x.2013.752715>
- Chow, B. W., Hui, A. N. N., & Chui, B. H. (2017). Creative literacy activities promote positive reading attitude in children learning English as a foreign language. *Journal of Research in Reading*, 41(2), 278-289. <https://doi.org/10.1111/1467-9817.12096>
- Chowdhury, T., Sandu, N., Gelpi, R., & Schaller, B. (2017). Trigemino-cardiac reflex: beyond a skull base reflex. *Future Neurology*, 12(3), 117-120. <https://doi.org/10.2217/fnl-2017-0015>
- Cicek, J. S., Labossiere, P., & Ingram, S. (2015). EXAMINING FOURTH YEAR ENGINEERING STUDENT PERCEPTIONS OF GRADUATE ATTRIBUTE COMPETENCIES: YEAR TWO. Proceedings of the Canadian Engineering Education Association (CEEA).
<https://doi.org/10.24908/pceea.v0i0.5878>
- Corsino, S. T., Lim, R. A., & Reyes, K. M. (2022). The Correlates of Language Learning Motivation of Senior High School Students. *Journal of World Englishes and Educational Practices*, 4(1), 01-09. <https://doi.org/10.32996/jweep.2022.4.1.1>
- Creswell, J. W. (2012). Educational research Planning, conducting, and evaluating quantitative and qualitative research (4th ed.). Boston, MA Pearson. - References - Scientific Research Publishing. (s. d.). <https://www.scirp.org/reference/ReferencesPapers?ReferenceID=757162>

- Crowe, A., Dirks, C., & Wenderoth, M. P. (2008a). Biology in Bloom: Implementing Bloom's Taxonomy to Enhance Student Learning in Biology. *CBE Life Sciences Education*, 7(4), 368-381. <https://doi.org/10.1187/cbe.08-05-0024>
- Cullinane, A. (2010). Bloom's Taxonomy and its Use in Classroom Assessment. *ResearchGate*. https://www.researchgate.net/publication/356194456_Bloom's_Taxonomy_and_its_Use_in_Classroom_Assessment
- Danesh, M., & Nourdad, N. (2017). On the Relationship between Creative Problem Solving Skill and EFL Reading Comprehension Ability. *Theory and Practice in Language Studies*, 7(3), 234. <https://doi.org/10.17507/tpls.0703.10>
- Deisseroth, K., & Schnitzer, M. J. (2013). Engineering Approaches to Illuminating Brain Structure and Dynamics. *Neuron*, 80(3), 568-577. <https://doi.org/10.1016/j.neuron.2013.10.032>
- Dekker, S., & Jolles, J. (2015). Teaching About "Brain and Learning" in High School Biology Classes: Effects on Teachers' Knowledge and Students' Theory of Intelligence. *Frontiers in Psychology*, 6. <https://doi.org/10.3389/fpsyg.2015.01848>
- Dekker, S., Lee, N. C., Howard-Jones, P., & Jolles, J. (2012). Neuromyths in Education: Prevalence and Predictors of Misconceptions among Teachers. *Frontiers In Psychology*, 3. <https://doi.org/10.3389/fpsyg.2012.00429>
- Deng, F., & Zou, Q. (2016). A Study on Whether the Adults' Second Language Acquisition Is Easy or Not—From the Perspective of Children's Native Language Acquisition. *Theory and Practice in Language Studies*, 6(4), 776. <https://doi.org/10.17507/tpls.0604.15>
- Devaki, V. (2021). Influence of Behaviourist and Cognitivist Theories in Adult Language Acquisition. *Elsya*, 3(1), 38-44. <https://doi.org/10.31849/elsya.v3i1.5620>
- Dewaele, J. (2004). The Emotional Force of Swearwords and Taboo Words in the Speech of Multilinguals. *Journal of Multilingual And Multicultural Development*, 25(2-3), 204-222. <https://doi.org/10.1080/01434630408666529>

- Dewaele, J., & Alfawzan, M. (2018). Does the effect of enjoyment outweigh that of anxiety in foreign language performance? *Studies in Second Language Learning and Teaching*, 8(1), 21-45. <https://doi.org/10.14746/ssllt.2018.8.1.2>
- Dewaele, J., & Dewaele, L. (2017). The dynamic interactions in foreign language classroom anxiety and foreign language enjoyment of pupils aged 12 to 18. A pseudo-longitudinal investigation. *Journal of The European Second Language Association*, 1(1), 12-22. <https://doi.org/10.22599/jesla.6>
- Dipolog, S. (2022). Language motivation of the students: A structural equation model. *International Journal of Research Studies in Education*, 11(16). <https://doi.org/10.5861/ijrse.2022.361>
- Dorji, P., & Yangzom. (2021). Affective Domain: The Uncharted Area of Teaching and Learning in Tertiary Education. *Asian Research Journal of Arts & Social Sciences*, 51-65. <https://doi.org/10.9734/arjass/2021/v13i130206>
- Dörnyei, Z. (1998). Motivation in second and foreign language learning. *Language Teaching*, 31(3), 117-135. <https://doi.org/10.1017/s026144480001315x>
- Dubrowski, A., Kapralos, B., Peisachovich, E., Da Silva, C., & Torres, A. (2021). A Model for an Online Learning Management System for Simulation-Based Acquisition of Psychomotor Skills in Health Professions Education. *Curēus*. <https://doi.org/10.7759/cureus.14055>
- Dulock, H. (1993). Research design: Descriptive research. <https://www.semanticscholar.org/paper/Research-Design%3A-Descriptive-Research-Dulock/041769c2a3d149e6b77b795a072976edb2f9d621>
- Durlak, J. A., Weissberg, R. P., Dymnicki, A. B., Taylor, R. D., & Schellinger, K. B. (2011). The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*, 82(1), 405-432. <https://doi.org/10.1111/j.1467-8624.2010.01564.x>

- Dussauge, I., & Kaiser, A. (2012). Neuroscience and Sex/Gender. *Neuroethics*, 5(3), 211-215.
<https://doi.org/10.1007/s12152-012-9165-5>
- Edward, M. (2022). Child language acquisition research on indigenous African sign languages: A commentary on Kidd and Garcia (2022). *First Language*, 42(6), 756-759.
<https://doi.org/10.1177/01427237221104049>
- El-Dali, H. M. (2019). An Alternative Approach to Linguistic Theories of Language Acquisition: Focus on The Cognitive Theory. *Journal of Advances in Linguistics*, 10, 1488-1522.
<https://doi.org/10.24297/jal.v10i0.8046>
- Elgamal, A. (2019). Cognitive Factors Affecting Language Learning and Acquisition of Native and Non-Native Speakers. *Journal of Research in Curriculum, Instructional and Educational Technology/Journal of Research in Curriculum, Instruction and Educational Technology*, 4(4), 135-152. <https://doi.org/10.21608/jrciet.2019.31960>
- Erođlu, E., Kolcu, G., & Kolcu, M. İ. B. (2022). The Effect of Distance Education Conducted during the COVID-19 Pandemic Period on the Psychomotor Skill Development of a Dental School Students. *BioMed Research International*, 2022, 1-7. <https://doi.org/10.1155/2022/6194200>
- Fantuzzo, J. W., Bulotsky-Shearer, R., Fusco, R. A., & McWayne, C. (2005). An investigation of preschool classroom behavioral adjustment problems and social-emotional school readiness competencies. *Early Childhood Research Quarterly*, 20(3), 259-275.
<https://doi.org/10.1016/j.ecresq.2005.07.001>
- Farag, H. M. F. (2020). Department of English, Faculty of Arts, Kafrelsheikh University. *Mağallaġ Al-Baġġ Al-ilmī Fī Al-Āadab (Online)/MağAllaġ Al-Baġġ Al-ilmī Fī Al-ĀAdab*, 21(5), 16-51. <https://doi.org/10.21608/jssa.2020.119147>
- Filmer, D., Molina, E., & Wane, W. (2020). *Learning-adjusted years of schooling (LAYS): Defining a new macro measure of education*. RISE Programme. Retrieved from

https://riseprogramme.org/sites/default/files/2020-11/RISE_WP-045_Filmer_Molina_Wane.pdf

- Freeman, S., Haak, D., & Wenderoth, M. P. (2011). Increased Course Structure Improves Performance in Introductory Biology. *CBE Life Sciences Education*, 10(2), 175-186. <https://doi.org/10.1187/cbe.10-08-0105>
- Friedman, I. A., Grobgedl, E., & Teichman-Weinberg, A. (2019). Imbuing Education with Brain Research Can Improve Teaching and Enhance Productive Learning. *Psychology*, 10(02), 122-311. <https://doi.org/10.4236/psych.2019.102010>
- Gabrieli, J. D. E. (2016). The promise of educational neuroscience: Comment on Bowers (2016). *Psychological Review*, 123(5), 613-619. <https://doi.org/10.1037/rev0000034>
- García-Morales, V. J., Garrido-Moreno, A., & Martín-Rojas, R. (2021). The Transformation of Higher Education After the COVID Disruption: Emerging Challenges in an Online Learning Scenario. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.616059>
- Gardner, R. C., Masgoret, A., Tennant, J., & Mihic, L. (2004). Integrative Motivation: Changes During a Year-Long Intermediate-Level Language Course. *Language Learning*, 54(1), 1-34. <https://doi.org/10.1111/j.1467-9922.2004.00247.x>
- Gardner, D., Akil, H., Ascoli, G. A., Bowden, D. M., Bug, W. J., Donohue, D. E., Goldberg, D. H., Grafstein, B., Grethe, J. S., Gupta, A., Halavi, M., Kennedy, D. N., Marengo, L. N., Martone, M. E., Miller, P. L., Müller, H., Robert, A., Shepherd, G. M., Sternberg, P. W., . . . Williams, R. W. (2008). The Neuroscience Information Framework: A Data and Knowledge Environment for Neuroscience. *Neuroinformatics*, 6(3), 149-160. <https://doi.org/10.1007/s12021-008-9024-z>
- Genesee, F. (2000). Introduction. *Bilingualism*, 3(3), 167-172. <https://doi.org/10.1017/s1366728900000316>

- Ghufron, S., Nafiah, N., Syahrudin, S., Kaswadi, K., & Mustofa, M. (2023). The Effect of STAD-Type Cooperative Learning Based on a Learning Tool on Critical Thinking Ability in Writing Materials. *International Journal of Instruction*, 16(1), 61-84. <https://doi.org/10.29333/iji.2023.1614a>
- Goswami, U. (2019). Speech rhythm and language acquisition: an amplitude modulation phase hierarchy perspective. *Annals of The New York Academy of Sciences*, 1453(1), 67-78. <https://doi.org/10.1111/nyas.14137>
- Green, J. M., & Oxford, R. (1995). A Closer Look at Learning Strategies, L2 Proficiency, and Gender. *TESOL Quarterly*, 29(2), 261. <https://doi.org/10.2307/3587625>
- Griffith, J. L., & Kohrt, B. A. (2015). Managing Stigma Effectively: What Social Psychology and Social Neuroscience Can Teach Us. *Academic Psychiatry*, 40(2), 339-347. <https://doi.org/10.1007/s40596-015-0391-0>
- Han, H., Soyulu, F., & Anchan, D. M. (2019). Connecting levels of analysis in educational neuroscience: A review of multi-level structure of educational neuroscience with concrete examples. *Trends In Neuroscience And Education*, 17, 100113. <https://doi.org/10.1016/j.tine.2019.100113>
- Hassabis, D., Kumaran, D., Summerfield, C., & Botvinick, M. (2017). Neuroscience-Inspired artificial intelligence. *Neuron*, 95(2), 245-258. <https://doi.org/10.1016/j.neuron.2017.06.011>
- Haynes, J. (2015a). A Primer on Pattern-Based Approaches to fMRI: Principles, Pitfalls, and Perspectives. *Neuron*, 87(2), 257-270. <https://doi.org/10.1016/j.neuron.2015.05.025>
- Heller, R. (2022). A new bloom – adding ‘collaborate’ to Bloom’s taxonomy. *Journal Of Learning Development In Higher Education*, 24. <https://doi.org/10.47408/jldhe.vi24.906>
- Hernández, A., & Amigó, J. M. (2018). Multilayer adaptive networks in neuronal processing. *The European Physical Journal. Special Topics*, 227(10-11), 1039-1049. <https://doi.org/10.1140/epjst/e2018-800037-y>

- Herting, M. M., Younan, D., Campbell, C. E., & Chen, J. (2019). Outdoor Air Pollution and Brain Structure and Function from Across Childhood to Young Adulthood: A Methodological Review of Brain MRI Studies. *Frontiers in Public Health*, 7. <https://doi.org/10.3389/fpubh.2019.00332>
- Higgins, D., Hayes, M., Taylor, J., & Wallace, J. (2020). A scoping review of simulation-based dental education. *MedEdPublish*, 9, 36. <https://doi.org/10.15694/mep.2020.000036.1>
- Horner, R., Zavodska, A., & Rushing, J. (2005). How challenging? Using Bloom's taxonomy to assess learning objectives in a degree completion program. *Journal of College Teaching & Learning/Journal Of College Teaching And Learning*, 2(3). <https://doi.org/10.19030/tlc.v2i3.1785>
- Hötte, K., Koch, M., Hof, L., Tuppi, M., Moreth, T., Versteegen, M. M. A., Van Der Laan, L. J. W., Stelzer, E. H. K., & Pampaloni, F. (2019). Ultra-thin fluorocarbon foils optimise multiscale imaging of three-dimensional native and optically cleared specimens. *Scientific Reports*, 9(1). <https://doi.org/10.1038/s41598-019-53380-2>
- Hövel, P., Viol, A., Loske, P., Merfort, L., & Vuksanović, V. (2018). Synchronization in Functional Networks of the Human Brain. *Journal of Nonlinear Science*, 30(5), 2259-2282. <https://doi.org/10.1007/s00332-018-9505-7>
- Huh, K., & Lee, J. (2019). Fostering creativity and language skills of foreign language learners through SMART learning environments: Evidence from fifth-grade Korean EFL learners. *TESOL Journal*, 11(2). <https://doi.org/10.1002/tesj.489>
- Hyland, T. (2014). Mindfulness-based interventions and the affective domain of education. *Educational Studies*, 40(3), 277-291. <https://doi.org/10.1080/03055698.2014.889596>

- Igolkina, N. (2022). Learners typology: language acquirer's vs language learners. *Focus On Language Education and Research*, 2(1), 23-28. <https://doi.org/10.35213/2686-7516-2021-2-2-23-28>
- Illes, J., & Bird, S. J. (2006). Neuroethics: a modern context for ethics in neuroscience. *Trends in Neurosciences*, 29(9), 511-517. <https://doi.org/10.1016/j.tins.2006.07.002>
- Imai, Y. (2010). Emotions in SLA: New Insights from Collaborative Learning for an EFL Classroom. *The æModern Language Journal/æModern Language Journal*, 94(2), 278-292. <https://doi.org/10.1111/j.1540-4781.2010.01021.x>
- Indu, P. V., & Vidhukumar, K. (2020). Research designs-an overview. *Kerala Journal of Psychiatry*, 32(1). <https://doi.org/10.30834/kjp.32.1.2019.179>
- Isa, C. M. M., Mustaffa, N. K., Joseph, E. O., & Preece, C. N. (2020). Development of Psychomotor Skill and Programme Outcome Attainment of Civil Engineering Students in Malaysia. *Asian Journal of Vocational Education and Humanities*, 1(2), 9-24. <https://doi.org/10.53797/ajvah.v1i2.2.2020>
- Jaiswal, P., & Al-Hattami, A. (2020a). Enhancing learners' academic performances using student centered approaches. *International Journal of Emerging Technologies in Learning/International Journal: Emerging Technologies in Learning*, 15(16), 4. <https://doi.org/10.3991/ijet.v15i16.14875>
- Jegerski, J. (2021). Krashen and second language processing. *Foreign Language Annals*, 54(2), 318-323. <https://doi.org/10.1111/flan.12557>
- Jiang, H., Islam, A. Y. M. A., Gu, X., & Spector, J. M. (2021). Online learning satisfaction in higher education during the COVID-19 pandemic: A regional comparison between Eastern and Western Chinese universities. *Education and Information Technologies*, 26(6), 6747-6769. <https://doi.org/10.1007/s10639-021-10519-x>

- Johnson, E. K., & White, K. S. (2019). Developmental sociolinguistics: Children's acquisition of language variation. *Wiley Interdisciplinary Reviews. Cognitive Science*, 11(1).
<https://doi.org/10.1002/wcs.1515>
- Jones, R. H. (2019). Creativity in language learning and teaching: Translingual practices and transcultural identities. *Applied Linguistics Review*, 11(4), 535-550.
<https://doi.org/10.1515/applirev-2018-0114>
- Teixeira, C., Knowledgea, A., Conversation, H., Hughes-Warrington, M., Van Den Akker, C., Pérez, M., Lerg, C., University, L. A., Unich, M., Östling, J., & Alves, C. (2023). History of Intellectual Culture 2/2023. Dans De Gruyter eBooks.<https://doi.org/10.1515/9783111078038>
- Kadia, K. (2022). The link between language learning and long-term memory. Research Square (Research Square). <https://doi.org/10.21203/rs.3.rs-1842265/v1>
- Kafol, B. S., Denac, O., Žnidaršič, J., & Zalar, K. (2015). Analysis of Music Education Objectives in Learning Domains. *Procedia: Social & Behavioral Sciences*, 186, 95-104.
<https://doi.org/10.1016/j.sbspro.2015.04.069>
- Kenton, W. (2022a, juillet 1). Sample: What It Means in Statistics, Types, and Examples. Investopedia. <https://www.investopedia.com/terms/s/sample.asp>
- Kern, R. S., Nuechterlein, K. H., Green, M. F., Baade, L. E., Fenton, W. S., Gold, J. M., Keefe, R. S., Mesholam-Gately, R., Mintz, J., Seidman, L. J., Stover, E., & Marder, S. R. (2008). The MATRICS Consensus Cognitive Battery, Part 2: Co-Norming and Standardization. *The American Journal of Psychiatry*, 165(2), 214-220.<https://doi.org/10.1176/appi.ajp.2007.07010043>
- Khaerudin, K., Munadi, S., & Supianto, S. (2020). Affective assessment using social media. *Universal Journal of Educational Research*, 8(7), 2921-2928.<https://doi.org/10.13189/ujer.2020.080720>

- Kharkhurin, A. (2016). Introducing bilingual creative education to russian school curriculum. *Vestnik Rossijskogo Universiteta Družby Narodov. Seriâ Psihologiâ I Pedagogika*, 4, 16-28. <https://doi.org/10.22363/2313-1683-2016-4-16-28>
- Khodabocus, R., Tran, K., Broom, T., & Razaq, A. (2015). Breakfast club: a simple, reproducible, student education initiative. *Medical Education*, 49(11), 1143-1144. <https://doi.org/10.1111/medu.12879>
- Kochmar, D., Budz, I., & Pochenyuk, Y. (2022). The linguistic and cultural aspect as a factor in the development of emotionality in foreign language teaching. *Aktual'ni Pitannâ Gumanitarnih Nauk*, 1(55), 165-173. <https://doi.org/10.24919/2308-4863/55-1-27>
- Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice, Digital/Theory into Practice*, 41(4), 212-218. https://doi.org/10.1207/s15430421tip4104_2
- La Corte, E., Ordóñez-Rubiano, E. G., Paiva, W. S., Johnson, J. M., & Serrao, G. (2022a). Editorial: Current state of the art of human brain white matter: From structural and functional connectivity to neurosurgical applications. *Frontiers in Neurology*, 13. <https://doi.org/10.3389/fneur.2022.1068212>
- Lai, W., & Wei, L. (2019). A Critical Evaluation of Krashen's Monitor Model. *Theory and Practice in Language Studies*, 9(11), 1459. <https://doi.org/10.17507/tpls.0911.13>
- Landa, R. L., & Clark, M. D. (2018). Effective Assessments for Interpreter Education Programs to Increase Pass Rates for Certification. *Psychology*, 09(03), 340-347. <https://doi.org/10.4236/psych.2018.93021>
- Lee, S. (2019). Her Story or their own stories? Digital game-based learning, student creativity, and creative writing. *ReCALL*, 31(3), 238-254. <https://doi.org/10.1017/s0958344019000028>
- Lewenstein, A. D. (2020). Brain Based: Understanding Treatment, Evidence and Recovery in Neuroscience and Psychology. <https://doi.org/10.14418/wes01.1.1255>

- Li, S., & Le, W. (2017). Milestones of Parkinson's Disease Research: 200 Years of History and Beyond. *Neuroscience Bulletin/Neuroscience Bulletin*, 33(5), 598-602. <https://doi.org/10.1007/s12264-017-0178-2>
- Li, X., Yuan, J., Qin, W., Yang, L., Yang, S., Li, Y., & Hu, W. (2021). Higher Total Cerebral Small Vessel Disease Burden Was Associated with Mild Cognitive Impairment and Overall Cognitive Dysfunction: A Propensity Score-Matched Case–Control Study. *Frontiers in Aging Neuroscience*, 13. <https://doi.org/10.3389/fnagi.2021.695732>
- Lichtman, K., & VanPatten, B. (2021a). Was Krashen right? Forty years later. *Foreign Language Annals*, 54(2), 283-305. <https://doi.org/10.1111/flan.12552>
- Liu, M., & Huang, W. (2011). An Exploration of Foreign Language Anxiety and English Learning Motivation. *Education Research International*, 2011, 1-8. <https://doi.org/10.1155/2011/493167>
- Liu, X., Xu, X., & Wang, H. (2018). The effect of emotion on morphosyntactic learning in foreign language learners. *PloS One*, 13(11), e0207592. <https://doi.org/10.1371/journal.pone.0207592>
- Lowe, M. J. (2010a). A historical perspective on the evolution of resting-state functional connectivity with MRI. *Magma*, 23(5-6), 279-288. <https://doi.org/10.1007/s10334-010-0230-y>
- Lukmani, Y. M. (1972). MOTIVATION TO LEARN AND LANGUAGE PROFICIENCY. *Language Learning*, 22(2), 261-273. <https://doi.org/10.1111/j.1467-1770.1972.tb00087.x>
- Macdonald, K., Germine, L., Anderson, A., Christodoulou, J., & McGrath, L. M. (2017). Dispelling the Myth: Training in Education or Neuroscience Decreases but Does Not Eliminate Beliefs in Neuromyths. *Frontiers in Psychology*, 8. <https://doi.org/10.3389/fpsyg.2017.01314>
- Mangin, J., & Gallo, V. (2010a). The Curious Case of NG2 Cells: Transient Trend or Game Changer? *ASN Neuro*, 3(1), AN20110001. <https://doi.org/10.1042/an20110001>

- Mateu, G., Monzani, L., & Navarro, R. M. (2017). The role of the brain in financial decisions: A review of the neuroeconomics field. *Mètode. Annual Review*, 0(8). <https://doi.org/10.7203/metode.8.6923>
- Mateu, G., Monzani, L., & Navarro, R. M. (2018). The role of the brain in financial decisions: A viewpoint on neuroeconomics. *Mètode. Annual Review*, 8, 6. <https://doi.org/10.7203/metode.0.6923>
- Memon, I. P., Pathan, H., & Thaheem, S. K. (2019). Attitudes and Motivation of Learners towards English: A Case Study of Intermediate Level Students District Matyari, Sindh, Pakistan. *International Journal of Linguistics*, 11(3), 57. <https://doi.org/10.5296/ijl.v11i3.14725>
- Mohammadian, T. (2013). The Effect of Shyness on Iranian EFL Learners' Language Learning Motivation and Willingness to Communicate. *Theory and Practice in Language Studies*, 3(11). <https://doi.org/10.4304/tpls.3.11.2036-2045>
- Mohammed, M., & Omar, N. (2020). Question classification based on Bloom's taxonomy cognitive domain using modified TF-IDF and word2vec. *PloS One*, 15(3), e0230442. <https://doi.org/10.1371/journal.pone.0230442>
- Momsen, J. L., Long, T. M., Wyse, S. A., & Ebert-May, D. (2010a). Just the Facts? Introductory Undergraduate Biology Courses Focus on Low-Level Cognitive Skills. *CBE Life Sciences Education*, 9(4), 435-440. <https://doi.org/10.1187/cbe.10-01-0001>
- Morfaki, C., & Skotis, A. (2022). Academic online learning experience during COVID-19 - a systematic literature review based on personality traits. *Higher Education, Skills and Work-based Learning*, 13(4), 697-719. <https://doi.org/10.1108/heswbl-03-2022-0062>
- Morris, R., Lord, S., Lawson, R. A., Coleman, S., Galna, B., Duncan, G. W., Khoo, T. K., Yarnall, A. J., Burn, D. J., & Rochester, L. (2017). Gait Rather Than Cognition Predicts Decline in Specific Cognitive Domains in Early Parkinson's Disease. *The Journals of Gerontology*.

Series A, Biological Sciences and Medical Sciences, 72(12), 1656-1662.

<https://doi.org/10.1093/gerona/glx071>

Morrison, E. S., Naro-Maciel, E., & Bonney, K. M. (2021). Innovation in a Time of Crisis: Adapting Active Learning Approaches for Remote Biology Courses. *Journal of Microbiology & Biology Education*, 22(1). <https://doi.org/10.1128/jmbe.v22i1.2341>

Mwale, O. G., & Kalawa, R. (2016). Factors affecting acquisition of psychomotor clinical skills by student nurses and midwives in CHAM Nursing Colleges in Malawi: A qualitative exploratory study. *BMC Nursing*, 15(1). <https://doi.org/10.1186/s12912-016-0153-7>

Myers, M. J., & Burgess, A. B. (2003b). INQUIRY-BASED LABORATORY COURSE IMPROVES STUDENTS' ABILITY TO DESIGN EXPERIMENTS AND INTERPRET DATA. *Advances in Physiology Education*, 27(1), 26-33. <https://doi.org/10.1152/advan.00028.2002>

Nakayama, K. (2021). Coming of Age in Science: Just Look? *Annual Review of Vision Science*, 7(1), 1-17. <https://doi.org/10.1146/annurev-vision-100419-120946>

Nathanson, L., Rivers, S. E., Flynn, L. M., & Brackett, M. A. (2016). Creating emotionally intelligent schools with ruler. *Emotion review*, 8(4), 305-310. <https://doi.org/10.1177/1754073916650495>

Nayef, E. G., Yaacob, N. R. N., & Ismail, H. N. (2013a). Taxonomies of Educational Objective Domain. *International Journal of Academic Research in Business & Social Sciences*, 3(9). <https://doi.org/10.6007/ijarbss/v3-i9/199>

Nguyen, C. T. N., & Nguyen, T. T. (2020). Non-Language-Major Students' Autonomy in Learning English in Vietnam. *Arab World English Journal*, 11(3), 184-192. <https://doi.org/10.24093/awej/vol11no3.11>

Nguyen, T., Netto, C. L. M., Wilkins, J. F., Bröker, P., Vargas, E. E., Sealfon, C. D., Puthipiroj, P., Li, K. S., Bowler, J. E., Hinson, H. R., Pujar, M., & Stein, G. M. (2021). Insights into Students' Experiences and Perceptions of Remote Learning Methods: From the COVID-19

Pandemic to Best Practice for the Future. *Frontiers in Education*, 6.
<https://doi.org/10.3389/feduc.2021.647986>

Nicholls, D., Sweet, L., & Hyett, J. (2014). Psychomotor Skills in Medical Ultrasound Imaging. *Journal of Ultrasound in Medicine*, 33(8), 1349-1352. <https://doi.org/10.7863/ultra.33.8.1349>

Njura, H. J., Kaberia, I. K., & Taaliu, S. T. (2020). Teaching secondary school agriculture at the psychomotor domain: a conceptual framework for enhanced skills development for food security. *The Journal of Agricultural Education and Extension/Journal of Agricultural Education and Extension*, 27(2), 111-131.
<https://doi.org/10.1080/1389224x.2020.1816479>

Nkhoma, M. Z., Lam, T. K., Sriratanaviriyakul, N., Richardson, J., Kam, B., & Lau, K. H. (2017). Unpacking the revised Bloom's taxonomy: developing case-based learning activities. *Education + Training*, 59(3), 250-264. <https://doi.org/10.1108/et-03-2016-0061>

Nordmann, E., Horlin, C., Hutchison, J., Murray, J., Robson, L., Seery, M. K., & MacKay, J. R. D. (2020). Ten simple rules for supporting a temporary online pivot in higher education. *PLOS Computational Biology/PLoS Computational Biology*, 16(10), e1008242.
<https://doi.org/10.1371/journal.pcbi.1008242>

Novikova, I. A., Berisha, N. S., Novikov, A. L., & Shlyakhta, D. A. (2020). Creativity and Personality Traits as Foreign Language Acquisition Predictors in University Linguistics Students. *Behavioral Sciences*, 10(1), 35. <https://doi.org/10.3390/bs10010035>

Opdenakker, R. (2006). Advantages and disadvantages of four interview techniques in qualitative research. *Forum: Qualitative Social Research*, 7(4). <https://doi.org/10.17169/fqs-7.4.175>

Nurmatova, S., & Altun, M. (2023). A Comprehensive Review of Bloom's Taxonomy Integration to Enhancing Novice EFL Educators' Pedagogical Impact. *Arab World English Journal*, 14(3), 380-388. <https://doi.org/10.24093/awej/vol14no3.24>

- Nurse.com. (2024, 1 mars). Neuroscience nursing tackles mysteries of the brain. Nurse.com.
<https://www.nurse.com/blog/neuroscience-nursing-tackles-mysteries-brain/>
- O'Regan, K. (2019). EMOTION AND E-LEARNING. *Online Learning*, 7(3).
<https://doi.org/10.24059/olj.v7i3.1847>
- O'Shea, M. (2013). The brain: Milestones of neuroscience. *New Scientist*, 218(2911), ii-iii.
[https://doi.org/10.1016/s0262-4079\(13\)60831-3](https://doi.org/10.1016/s0262-4079(13)60831-3)
- Özdemir, V., & Özkan, M. B. (2016). The Use of Language Learning Strategies in Course Books. *Participatory Educational Research*, spi16(1), 57-62. <https://doi.org/10.17275/per.16.spi.1.7>
- Pankowski, D., Wytrychiewicz-Pankowska, K., & Owczarek, W. (2022). Cognitive impairment in psoriasis patients: a systematic review of case–control studies. *Journal of Neurology*, 269(12), 6269-6278. <https://doi.org/10.1007/s00415-022-11317-2>
- Panthalookaran, V. (2021a). Beyond Bloom's Taxonomy: Emergence of Entrepreneurial Education. *Higher Education for The Future*, 9(1), 45-61. <https://doi.org/10.1177/23476311211046176>
- Paradis, J., & Genesee, F. (1996). Syntactic Acquisition in Bilingual Children. *Studies in Second Language Acquisition*, 18(1), 1-25. <https://doi.org/10.1017/s0272263100014662>
- Pardede, P. (2020). Integrating the 4Cs into EFL Integrated Skills Learning. *Journal of English Teaching*, 6(1), 71-85. <https://doi.org/10.33541/jet.v6i1.190>
- Parwata, I. G. A. L., Jayanta, I. N. L., & Widiana, I. W. (2023). Improving Metacognitive Ability and Learning Outcomes with Problem-Based Revised Bloom's Taxonomy Oriented Learning Activities. *Emerging Science Journal*, 7(2), 569-577. <https://doi.org/10.28991/esj-2023-07-02-019>
- Pedro, P. M. (2020). The acquisition of causatives in Q'anjob'al Maya. *First Language*, 014272372096682. <https://doi.org/10.1177/0142723720966827>

- Peker, H., & Ozkaynak, O. (2020a). Girdi Hipotezi ve Monitör Modelinin Yetersizliği, Anlaşılabilir Girdilerin Operasyonel Tanımı ve “Edinme” teriminin Yanıltıcı Kullanımı Üzerine Eleştirel Bir İnceleme. *Dil Eğitimi Ve Araştırmaları Dergisi*, 6(1), 238-250. <https://doi.org/10.31464/jlere.617587>
- Petitto, L. A., Katerelos, M., Levy, B. G., Gauna, K., Tétreault, K., & Ferraro, V. (2001). Bilingual signed and spoken language acquisition from birth: implications for the mechanisms underlying early bilingual language acquisition. *Journal of Child Language*, 28(2), 453-496. <https://doi.org/10.1017/s0305000901004718>
- Pierce, L. J., Genesee, F., Delcenserie, A., & Morgan, G. (2017). Variations in phonological working memory: Linking early language experiences and language learning outcomes. *Applied Psycholinguistics*, 38(6), 1265-1300. <https://doi.org/10.1017/s0142716417000236>
- Pikhart, M., & Klimova, B. (2019a). Utilization of Linguistic Aspects of Bloom’s Taxonomy in Blended Learning. *Education Sciences*, 9(3), 235. <https://doi.org/10.3390/educsci9030235>
- Pujawan, I. G. N., Rediani, N. N., Antara, I. G. W. S., Putri, N. N. C. A., & Bayu, G. W. (2022). Revised Bloom Taxonomy-Oriented Learning Activities to Develop Scientific Literacy and Creative Thinking Skills. *Jurnal Pendidikan IPA Indonesia/JPPI: Jurnal Pendidikan IPA Indonesia*, 11(1), 47-60. <https://doi.org/10.15294/jpii.v11i1.34628>
- Puka, K., & Smith, M. L. (2021). Long-term outcomes of children with drug-resistant epilepsy across multiple cognitive domains. *Developmental Medicine and Child Neurology/Developmental Medicine & Child Neurology*, 63(6), 690-696. <https://doi.org/10.1111/dmcn.14815>
- Rahayu, A. (2018). The Analysis of Students’ Cognitive Ability Based on Assessments of the Revised Bloom’s Taxonomy on Statistic Materials. *European Journal of Multidisciplinary Studies*, 7(2), 80. <https://doi.org/10.26417/ejms.v7i2.p80-85>

- Rayuwati, R. (2020). How educational technology innovates distance learning during pandemic crisis in remote areas in Indonesia? *International Journal of Management, IT and Social Sciences*, 7(6), 161-166. <https://doi.org/10.21744/irjmis.v7n6.1032>
- Richards, J. C. (2020). Exploring Emotions in Language Teaching. *RELC Journal*, 53(1), 225-239. <https://doi.org/10.1177/0033688220927531>
- Ringo, S. S., Samsudin, A., & Ramalis, T. R. (2020). Utilizing Rasch Model to Analyze A Gender Gap in Students' Cognitive Ability on Simple Harmonic Motion. *Journal Of Physics. Conference Series*, 1467(1), 012054. <https://doi.org/10.1088/1742-6596/1467/1/012054>
- Riyanti, D. (2019). THE ROLE OF MOTIVATION IN LEARNING ENGLISH AS a FOREIGN LANGUAGE. *Journal of English Language Teaching Innovations and Materials*, 1(2), 29. <https://doi.org/10.26418/jeltim.v1i1.27788>
- Ross, D. A., Travis, M. J., & Arbuckle, M. R. (2015). The Future of Psychiatry as Clinical Neuroscience. *JAMA Psychiatry*, 72(5), 413. <https://doi.org/10.1001/jamapsychiatry.2014.3199>
- Salyers, V. L. (2007). Teaching Psychomotor Skills to Beginning Nursing Students Using a Web-Enhanced Approach: A Quasi-Experimental Study. *International Journal of Nursing Education Scholarship*, 4(1). <https://doi.org/10.2202/1548-923x.1373>
- Sari, P. Y., Sofyan, D., & Hati, G. M. (2019). Language learning strategies used by successful students of the english education study program at university of bengkulu. *Journal of English Education and Teaching*, 2(4), 68-75. <https://doi.org/10.33369/jeet.2.4.68-75>
- Schildkrout, B., Benjamin, S., & Lauterbach, M. D. (2016a). Integrating Neuroscience Knowledge and Neuropsychiatric Skills into Psychiatry. *Academic Medicine*, 91(5), 650-656. <https://doi.org/10.1097/acm.0000000000001003>

- Second Language Acquisition and Learning: Rethinking the Pedagogical Applicability of Stephen Krashen's Monitor Model. (2020). *International Journal of Social Research*, 50. <https://doi.org/10.28933/ijsr-2020-09-0805>
- Selfa-Sastre, M., Pifarré, M., Cujba, A., Cutillas, L., & Falguera, E. (2022). The Role of Digital Technologies to Promote Collaborative Creativity in Language Education. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.828981>
- Semsar, K., & Casagrand, J. (2017a). Bloom's dichotomous key: a new tool for evaluating the cognitive difficulty of assessments. *Advances in Physiology Education*, 41(1), 170-177. <https://doi.org/10.1152/advan.00101.2016>
- Shaheen, M., Pradhan, S., & Ranajee, N. (2019). Sampling in Qualitative Research. Dans *Advances in business information systems and analytics book series* (p. 25-51). <https://doi.org/10.4018/978-1-5225-5366-3.ch002>
- Shahriari-Rad, A., Cox, M., & Woolford, M. (2017). Clinical Skills Acquisition: Rethinking Assessment Using a Virtual Haptic Simulator. *Technology, Knowledge and Learning*, 22(2), 185-197. <https://doi.org/10.1007/s10758-017-9308-1>
- Shaikh, S., Daudpotta, S. M., & Imran, A. S. (2021). Bloom's Learning Outcomes' Automatic Classification Using LSTM and Pretrained Word Embeddings. *IEEE Access*, 9, 117887-117909. <https://doi.org/10.1109/access.2021.3106443>
- Shalev, A. Y., & Jacoby, R. (2018). The neuropsychology of posttraumatic stress disorder. In A. F. Coskun & A. E. Carpenter (Eds.), *American Psychiatric Association Publishing Textbook of Neuropsychiatry and Clinical Neurosciences* (6th ed., pp. 1-12). American Psychiatric Association Publishing.
- Sharma, U. N. (2021). Teachers' Beliefs on Students' Home Language as a Resource in EFL Classroom. *Studies in ELT and Applied Linguistics*, 1(1), 116-126. <https://doi.org/10.3126/seltal.v1i1.40612>

- Shephard, K. (2008). Higher education for sustainability: seeking affective learning outcomes. *International Journal of Sustainability in Higher Education*, 9(1), 87-98.
<https://doi.org/10.1108/14676370810842201>
- Sizer, P. P., Sawyer, S., Felstehausen, V., Couch, S., Dornier, L., & Cook, C. (2008). Intrinsic and Extrinsic Factors Important to Manual Therapy Competency Development: A Delphi Investigation. *The Journal of Manual & Manipulative Therapy*, 16(1), 9E-19E.
<https://doi.org/10.1179/jmt.2008.16.1.9e>
- Skaalvik, E. M., Gjerustad, C., Federici, R. A., & Blackstad, A. A. (2022). Empowering principals to conduct classroom observations in a centralized education system: Does it make a difference for teacher self-efficacy and instructional practices? *Journal of Educational Research*, 116(4), 367-386
https://www.researchgate.net/publication/366121247_Empowering_principals_to_conduct_classroom_observations_in_a_centralized_education_system_does_it_make_a_difference_for_teacher_self-efficacy_and_instructional_practices
- Skinner, A., Diller, D., Kumar, R., Cannon-Bowers, J., Smith, R., Tanaka, A., Julian, D., & Perez, R. (2018). Development and application of a multi-modal task analysis to support intelligent tutoring of complex skills. *International Journal of STEM Education*, 5(1).
<https://doi.org/10.1186/s40594-018-0108-5>
- Smoyer, A. B., O'Brien, K., & Rodriguez-Keyes, E. (2020). Lessons learned from COVID-19: Being known in online social work classrooms. *International Social Work*, 63(5), 651-654.
<https://doi.org/10.1177/0020872820940021>
- Sönmez, V. (2017). Association of Cognitive, Affective, Psychomotor and Intuitive Domains in Education, Sönmez Model. *Universal Journal of Educational Research*, 5(3), 347-356.
<https://doi.org/10.13189/ujer.2017.050307>
- Sprung, J., Knopman, D. S., Petersen, R. C., Mielke, M. M., Weingarten, T. N., Vassilaki, M., Martin, D. P., Schulte, P. J., Hanson, A. C., Schroeder, D. R., Laporta, M. L., White, R. J.,

- Vemuri, P., & Warner, D. O. (2020). Association of Hospitalization with Long-Term Cognitive Trajectories in Older Adults. *Journal of The American Geriatrics Society*, 69(3), 660-668. <https://doi.org/10.1111/jgs.16909>
- Surianarayanan, C., Lawrence, J. J., Chelliah, P. R., Prakash, E., & Hewage, C. (2023a). Convergence of Artificial Intelligence and Neuroscience towards the Diagnosis of Neurological Disorders—A Scoping Review. *Sensors*,23(6), 3062. <https://doi.org/10.3390/s23063062>
- Susantini, E., Suyatno, N., Wasis, N., Zain, H. H. M., & Borhan, M. T. (2021a). Developing an Assessment-Link Mobile Application: A Catalyst for Pre-service Biology Teachers to Analyse Cognitive Test. *E3S Web of Conferences*, 328, 04008. <https://doi.org/10.1051/e3sconf/202132804008>
- Swanson, L. W. (2018). Brain maps 4.0—Structure of the rat brain: An open access atlas with global nervous system nomenclature ontology and flatmaps. *Journal of Comparative Neurology*,526(6), 935-943. <https://doi.org/10.1002/cne.24381>
- Swensen, L. D., Kelley, E., Fein, D., & Naigles, L. R. (2007). Processes of Language Acquisition in Children withAutism: Evidence from Preferential Looking. *Child Development*, 78(2), 542-557. <https://doi.org/10.1111/j.1467-8624.2007.01022.x>
- Tamiya, H., Ouchi, A., Chen, R., Miyazawa, S., Akimoto, Y., Kaneda, Y., & Sora, I. (2018). Neurocognitive Impairments Are More Severe in the Binge-Eating/Purging Anorexia Nervosa Subtype Than in the Restricting Subtype. *Frontiers in Psychiatry*, 9. <https://doi.org/10.3389/fpsyt.2018.00138>
- Thach, T. D. L. (2022). Teachers' Perceptions of Comprehensible Input on English Vocabulary Acquisition. *International Journal of Language Instruction*, 1(1), 120-131. <https://doi.org/10.54855/ijli.221110>

- Thoirs, K., & Coffee, J. (2012). Developing the clinical psychomotor skills of musculoskeletal sonography using a multimedia DVD: A pilot study. *Australasian Journal of Educational Technology*, 28(4). <https://doi.org/10.14742/ajet.836>
- Thompson, A. R., & O'Loughlin, V. D. (2014a). The Blooming Anatomy Tool (BAT): A discipline-specific rubric for utilizing Bloom's taxonomy in the design and evaluation of assessments in the anatomical sciences. *Anatomical Sciences Education*, 8(6), 493-501. <https://doi.org/10.1002/ase.1507>
- Tsapekos, D., Strawbridge, R., Mantingh, T., Cella, M., Wykes, T., & Young, A. H. (2020). Role of cognitive reserve in cognitive variability in euthymic individuals with bipolar disorder: cross-sectional cluster analysis. *BJPsych Open*, 6(6). <https://doi.org/10.1192/bjo.2020.111>
- Tuma, F., & Nassar, A. K. (2021). Applying Bloom's taxonomy in clinical surgery: Practical examples. *Annals of Medicine and Surgery*, 69. <https://doi.org/10.1016/j.amsu.2021.102656>
- Ullman, M. T. (2004). Contributions of memory circuits to language: the declarative/procedural model. *Cognition*, 92(1-2), 231-270. <https://doi.org/10.1016/j.cognition.2003.10.008>
- Ullman, M. T., & Lovelett, J. T. (2016). Implications of the declarative/procedural model for improving second language learning: The role of memory enhancement techniques. *Second Language Research*, 34(1), 39-65. <https://doi.org/10.1177/0267658316675195>
- Ullman, S. (2019). Using neuroscience to develop artificial intelligence. *Science*, 363(6428), 692-693. <https://doi.org/10.1126/science.aau6595>
- Ushida, E. (2013). Role of Students' Attitudes and Motivation in Second Language Learning in Online Language Courses. *calico Journal*, 23(1), 49-78. <https://doi.org/10.1558/cj.v23i1.49-78>
- Ushioda, E. (2012). Motivation in Second Language Acquisition. *The Encyclopedia of Applied Linguistics*. <https://doi.org/10.1002/9781405198431.wbeal0777>

- Van Duijvenvoorde, A. C. K., Whitmore, L. B., Westhoff, B., & Mills, K. L. (2022). A methodological perspective on learning in the developing brain. *Npj Science of Learning*, 7(1). <https://doi.org/10.1038/s41539-022-00127-w>
- Vaus, D. A.D. (2001). *Research Design in Social Research*. SAGE <https://libguides.usc.edu/writingguide/researchdesigns>
- Victoria, G., Apiquian, R., Rosetti, M. F., & Ulloa, R. (2019). Cognitive impairment and its improvement after six months in adolescents with schizophrenia. *Schizophrenia Research: Cognition*, 17, 100135. <https://doi.org/10.1016/j.scog.2019.100135>
- Wang, H., & Cheng, Y. (2016). Dissecting language creativity: English proficiency, creativity, and creativity motivation as predictors in EFL learners' metaphoric creativity. *Psychology of Aesthetics, Creativity, And The Arts*, 10(2), 205-213. <https://doi.org/10.1037/aca0000060>
- Weisberg, D. S., Keil, F. C., Goodstein, J., Rawson, E., & Gray, J. R. (2008). The seductive allure of neuroscience explanations. *Journal of Cognitive Neuroscience*, 20(3), 470-477. https://www.researchgate.net/publication/5841960_The_Seductive_Allure_of_Neuroscience_Explanations
- Werker, J. (2012). Perceptual foundations of bilingual acquisition in infancy. *Annals of The New York Academy of Sciences*, 1251(1), 50-61. <https://doi.org/10.1111/j.1749-6632.2012.06484.x>
- Westergaard, M. (2019). Microvariation in multilingual situations: The importance of property-by-property acquisition. *Second Language Research*, 37(3), 379-407. <https://doi.org/10.1177/0267658319884116>
- White, M. J. (2020). Phonological working memory and non-verbal complex working memory as predictors of future English outcomes in young ELLs. *International Journal of Bilingualism*, 25(1), 318-337. <https://doi.org/10.1177/1367006920948136>

- Wiranata, D., Widiana, I. W., & Bayu, G. W. (2021). The Effectiveness of Learning Activities Based on Revised Bloom Taxonomy on Problem-Solving Ability. *Indonesian Journal of Educational Research and Review*, 4(2), 289. <https://doi.org/10.23887/ijerr.v4i2.37370>
- Wu, C. H., Lin, H. K., Wang, T., Huang, T., & Huang, Y. (2022). Affective Mobile Language Tutoring System for Supporting Language Learning. *Frontiers in Psychology*, 13. <https://doi.org/10.3389/fpsyg.2022.833327>
- Wu, Z., Phyo, A. Z. Z., Al-Harbi, T., Woods, R. L., & Ryan, J. (2020). Distinct Cognitive Trajectories in Late Life and Associated Predictors and Outcomes: A Systematic Review. *Journal of Alzheimer's Disease Reports*, 4(1), 459-478. <https://doi.org/10.3233/adr-200232>
- Xu, X. (2022). Exploring the Emotional Regulation during Foreign Language Learning in a Computer-Supported Collaborative Learning Environment. *Journal of Education, Humanities and Social Sciences*, 1, 383-392. <https://doi.org/10.54097/ehss.v1i.753>
- Yaoqing, Z. (2021a). Review of Enlightenment of Emotional Factors in Krashen's Affective Filter Hypothesis on English Teaching Research in College. *Advances in Social Science, Education and Humanities Research/Advances in Social Science, Education and Humanities Research*. <https://doi.org/10.2991/assehr.k.211220.256>
- Yin, K., Lee, P., Sheldon, O. J., Li, C., & Zhao, J. (2021). Personality profiles based on the FFM: A systematic review with a person-centered approach. *Personality and Individual Differences*, 180, 110996. <https://doi.org/10.1016/j.paid.2021.110996>
- Yin, X. (2021). The Interplay of EFL Students' Enjoyment, Hope, Pride and Self-Regulation. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.803476>
- Ziskin, J. L., Nishiyama, A., Rubio, M., Fukaya, M., & Bergles, D. E. (2007). Vesicular release of glutamate from unmyelinated axons in white matter. *Nature Neuroscience*, 10(3), 321-330. <https://doi.org/10.1038/nn1854>

Appendix 1 : Teachers' questionnaire

Dear teachers,

This questionnaire aims to investigate the role of Bloom's taxonomy in developing the cognitive neuroscience of young Algerian English learners in primary schools, which would be a great pleasure to receive your valuable responses to help us submit a beneficial research thesis in the academic area.

Personal information:

- School name:
- Years of teaching experience:

1. Have you ever heard of Bloom's taxonomy? If so, how frequently do you use it in your lessons?

- Always
- Never
- sometimes

2. Have you received any training or professional development related to Bloom's Taxonomy implementation in the classroom?

- Yes
- No

3. How often do you incorporate Bloom's taxonomy into lesson planning and instructional practices?

- Always
- Often
- Sometimes
- Rarely

- Never

4. What are the benefits of using Bloom’s taxonomy in teaching English to young learners?

.....
.....

5. Have you faced any challenges or difficulties when implementing Bloom’s taxonomy in your lessons?

- Yes
- No

If yes, please describe the challenges or difficulties you faced.

.....
.....

6. In your opinion, how could Bloom's Taxonomy, if integrated into teaching methods, enhance the neuroscience development of young learners?

.....
.....

7. What methods and techniques do you adopt to inspire your students to develop higher-order thinking abilities?

.....
.....

8. How do you use Bloom's taxonomy to measure your student's progress and help them improve their cognitive skills and achieve their academic goals?

.....
.....

9. Have you tried changing Bloom's taxonomy levels to better meet the individual needs of your learners? If so, describe what it would be like.

.....
.....

10. Have you noticed any significant improvement in your student's engagement and motivation levels ever since you began incorporating Bloom's taxonomy into your lessons?

.....
.....

11. What specific professional development or training do you believe teachers need to effectively incorporate Bloom's Taxonomy into their lessons?

.....
.....
.....

12. What are your suggestions for using Bloom's Taxonomy to study young learners' English language processing from a neurocognitive perspective in primary school?

.....
.....
.....
.....

Appendix 2: Medical teachers' Interview

Dear Medical Teachers,

Your experience in the field of neuroscience will provide our research with valuable insights into gathering both objective and subjective data. Your contribution to the topic will be highly appreciated and will add a special touch to its development.

1. A clear understanding of memory's role in language acquisition is essential for the learner who wishes to master a new language from a neuroscience perspective; exploring how our brain processes and stores linguistic information is fascinating. Based on your experience, could you please provide me with an explanation of the role of memory in language learning?
2. To learn a language effectively, it is essential to focus and pay close attention to the words, phrases, and grammar structures being used. In your opinion, what is the close connection between attention and language learning?
3. Motivation and emotional factors are crucial in optimizing the learning process. Please discuss these factors in language learning from a neuroscience perspective.
4. In your experience, what are the main challenges and difficulties that young learners face regarding cognitive development?
5. Cognitive neuroscience provides a deeper understanding of how the brain processes information, which can help us create better teaching methods for young learners. According to you, how could this understanding help improve teaching methods for young learners?
6. Are there any specific research studies that show the impact of cognitive neuroscience-based teaching methods on young learners?
7. How can teachers and policymakers collaborate with neurologists to improve language learning programs?

8. Could you provide any specific recommendations for teachers to integrate principles of cognitive neuroscience into their teaching effectively?
9. From a cognitive neuroscience perspective, how do different levels of Bloom's Taxonomy contribute to the overall cognitive development of young Algerian learners, particularly in relation to language acquisition?