



**SELINUS UNIVERSITY**  
OF SCIENCES AND LITERATURE

**CRITICAL REVIEW OF TEACHING AND  
LEARNING METHODOLOGIES FOR LEARNERS  
WITH SPECIAL EDUCATIONAL**

By MONIQUE J. GRANT COKE

Supervised by  
Prof. Salvatore Fava Ph.D.

**A DISSERTATION**

Presented to the Department of  
Higher Educational Administration  
program at Selinus University

Faculty of Arts & Humanities  
in fulfillment of the requirements  
for the degree of Doctor of Philosophy  
in Higher Educational Administration

2021

## **ABSTRACT**

The number of children with SEN is continuously growing, leading to pressure on the few special schools available in the USA. Furthermore, the adoption of a special school system has been criticized on the basis that it isolates and discriminates against children with special educational needs and disabilities. Even though inclusive education can address such limitations, the application of the most appropriate pedagogical approaches for SEN learners is still a challenge. The presented study focused on critically appraising the pedagogical approaches for SEN learners in the 21<sup>st</sup> century and beyond. In order to achieve this goal, a systematic review of the literature approach was adopted. The literature search process was conducted on three databases: Education Full Text, Linguistics and Language Behavior Abstracts, and PsycINFO. The selection of these databases was influenced by their reputation of hosting high quality and up-to-date literature about special education. The initial literature search process generated 6129 hits, but only ten studies were finally selected for review after the application of inclusion and exclusion criteria. A critical review of the evidence presented in the selected studies generated eight themes describing various pedagogical approaches for special education, within both blended and mainstream learning environment. Knowledge generated in this systematic review can be used by the special education sector of the U.S to develop pedagogical approaches for SEN students, leading to improved performance and social skill development.

*Keywords:* special educational needs, blended and mainstream learning, pedagogical techniques

## Table of Contents

Abstract .....	i
Chapter One: Introduction .....	1
1.1 Introduction .....	1
1.2 Background of The Problem .....	1
1.3 Problem Statement .....	6
1.4 Purpose of The Study .....	7
1.5 Significance of The Study .....	8
1.6 Research Questions .....	8
1.7 Research Aim and Objectives .....	8
1.7.1 Research Aim .....	8
1.7.2 Research Objectives .....	9
1.8 Assumptions and Scope .....	9
1.9 Organization of The Research Paper.....	10
Chapter Two: Methodology .....	12
2.1 Introduction .....	12
2.2 Methodology Selected for this Study .....	12
2.3 Literature Search Strategy.....	14
2.4 Keywords and Search Terms.....	15
2.5 Databases for Literature Search .....	17
2.5.1 Education Full Text (EBSCO).....	18
2.5.2 Linguistics and Language Behavior Abstracts .....	19
2.5.3 PsycINFO via ProQuest.....	20

2.6 Inclusion and Exclusion Criteria .....	21
2.6.1 Inclusion Criteria .....	22
2.6.2 Exclusion Criteria .....	24
2.7 Literature Quality Assessment .....	25
2.8 Chapter Summary .....	26
Chapter Three: Literature Search Results .....	28
3.1 Introduction .....	28
3.2 Literature Selection Process .....	28
3.3 Summary of the Literature Selected for Review .....	31
3.4 Quality Assessment of the Selected Literature .....	38
3.5 Chapter Summary .....	43
Chapter Four: Findings and Discussion .....	45
4.1 Introduction .....	45
4.2 Findings .....	45
4.2.1 Flipped Classroom .....	45
4.2.2 Project-Based Learning .....	47
4.2.3 Cooperative Learning .....	49
4.2.4 Gamification .....	51
4.2.5 Problem-Based Learning .....	54
4.2.6 Design Thinking Approach .....	57
4.2.7 Thinking-Based Learning .....	60
4.2.8 Competency-Based Learning .....	62
4.3 Discussions .....	66

4.4 Chapter Summary.....	78
Chapter Five: Conclusion and Recommendations.....	80
5.1 Introduction.....	80
5.2 Conclusion.....	80
5.2.1 Limitations of the Study.....	81
5.3 Recommendations.....	82
5.3.1 Recommendations for Special Education Practice.....	82
5.3.2 Recommendations for Future Research.....	83
References.....	85
Appendices.....	92
Appendix 1: Newcastle-Ottawa Scale (NOS) for Quality Assessment.....	92

## **CHAPTER ONE: INTRODUCTION**

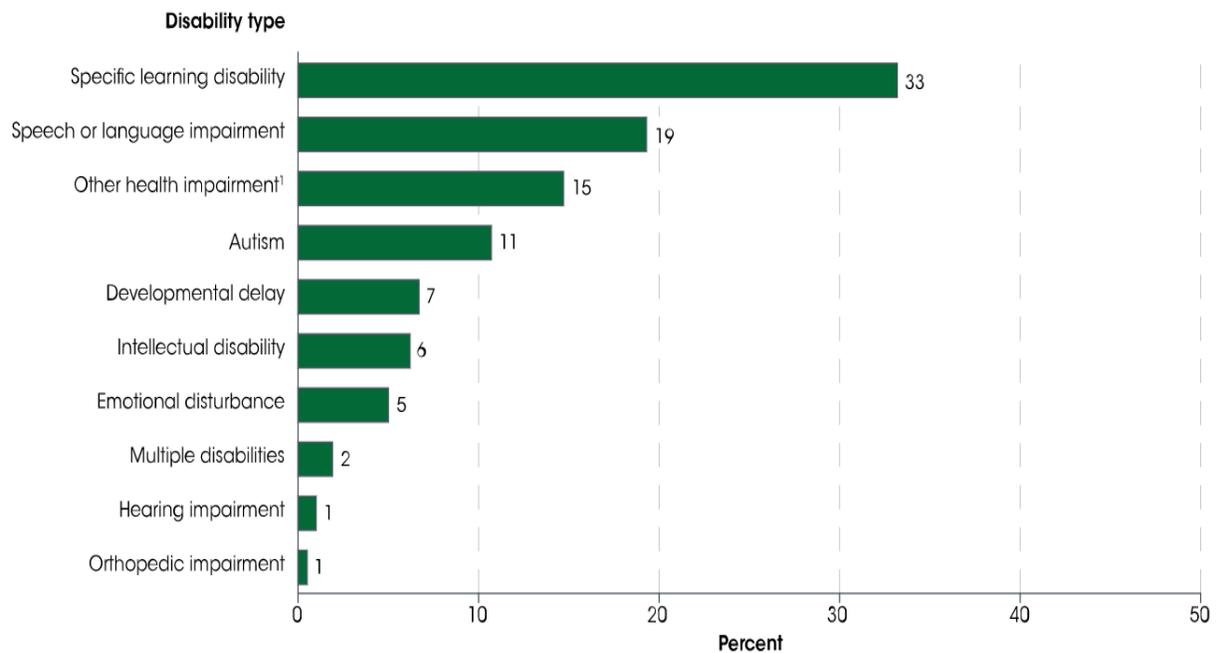
### **1.1 Introduction**

In this chapter, a detailed explanation of the background information for this systematic review of literature, including its rationale and goals, is presented. The chapter presents background information about the learners with special educational needs and disabilities, challenges they face, and key strategies that have been developed to improve their educational outcomes. The chapter further provides a comprehensive description of the problem statement, research purpose, and study significance. The other sections contained in this chapter include a description of research questions, aim, and objectives. Assumptions adopted during the formulation of research methods and methodologies as well as the scope of this systematic review of literature are also explained in this chapter. Finally, this chapter explains the overall organization of the whole research paper by providing an overview and purpose of every chapter.

### **1.2 Background of The Problem**

Special education involves instructions that are designed to realize the personal needs of children learning disorders and disabilities (NDA, 2018). In the United States, there are millions of children with learning disorders and disabilities who are provided with special services at school, which are designed based on their unique needs. For example, the US Department of Education (2019) the Individuals with Disabilities Education Act (IDEA) had governed provision of special education and associated services to not less than 7.5 million qualified learners with disabilities during the 2018-19 academic year. Correspondingly, NCES (2020) reported that approximately 7.1 million students of ages 3-21 years or 14% of all the public-school learners received special educational support under the IDEA in the 2018-19 academic year and that 33%

of the supported learners experienced specific learning disabilities. In the same academic year, 19%, 15%, and 11% of the supported students had speech or language impairment, other health problems (such as limited strength as a consequence of chronic or acute health problems including sickle cell anemia, heart disorder, rheumatic fever, nephritis, among others) and autism respectively. Figure 1 below describes the percentage distribution of students who benefited from special education services under IDEA in the 2018-19 academic year.



**Figure 1:** Percentage Distribution of Students Who Benefited from Special Education Services Under IDEA in 2018-19 Academic Year. Adopted from NCES (2020)

According to NDA (2018), learners with special educational needs (SEN) often have disabilities that limit their ability to read, comprehend or write and that such learners are always protected by federal laws. Two of the most significant federal laws targeting the SEN learners include IDEA and Section 504. With reference to the explanations by the U.S Department of Education (2019), IDEA authorizes special education for learners with disabilities in addition to early intervention services of the federal government to infants and preschoolers living with

disabilities. On the other hand, Section 504 of the Rehabilitation Act of 1973 forbids all strategies and activities from any form of discriminatory practice on the basis of disabilities. The law, therefore, applies to all public school districts. Table 1 below describes the 13 groups of disabilities recognized by the IDEA and under which a child affected is qualified to benefit from special education and associated services.

**Table 1:** Categories of Disabilities Recognized by the IDEA. Definitions Are Derived from the U.S Department of Education (2019).

<b>Special Need</b>	<b>Description</b>
Autism	Wide range of conditions involving challenges associated with repetitive behaviors, social skills, verbal and nonverbal communication.
Deaf-blindness	A condition characterized by both sight and hearing impairment leading to difficulties in communication, mobility, and access to information.
Deafness	Complete or partial hearing impairment, leading to poor communication ability.
Developmental delay	Refers to a condition where children fail to acquire all the developmental skills expected, such as motor function, language, speech, cognitive, play, and social skills, compared to their peers.
Emotional disturbance	Condition displaying a single or multiple cases of the following characteristics on a long-term basis and to a noticeable level

	that cause negative impacts on learners' social and academic performance.
Hearing impairment	Involves hearing loss below 90 decibels, and can be permanent or temporary, causing adverse impacts on children's educational performance.
Mental retardation	A condition characterized by below-average intelligence, mental ability, and lack of skills required for the learning process.
Multiple disabilities	Include affiliated impairments, such as intellectual disability-orthopedic problems. Such a combination leads to severe educational needs.
Orthopedic impairment	A condition where a person's orthopedic impairments lead to adverse impacts on their educational performance and can be caused by congenital anomalies.
Special learning disability	A condition in a single or multiple forms of basic psychological processes involved in language use and communication leading to limited ability to listen, speak, write, think and read.
Speech or language impairment	Involves communication disorders, including impaired articulation, voice impairment, stuttering, which unfavorably impact a learner's academic and social performance.
Traumatic brain injury	Refers to non-degenerative and non-congenital brain damage leading to either permanent or temporary physical, cognitive or psychosocial function impairment.

Visual impairment, including blindness	A description of any form of sight loss that can be either permanent (blindness) or temporary impacting child's educational performance.
--	--

With reference to the outcomes from the survey by OSEP (2019), 6.75% of learners with special education needs are of the ages 3-5 years and that male learners were likely to receive special education services under IDEA than female counterparts. The analysis further revealed that 45.5% of learners who benefited from the IDEA regulated services in the 2018-19 academic year attended a regular early childhood program and benefited from a large percentage of the services offered in that location; the remaining 54.5% of the learners received a large percentage of the services from another location, such as separate special education class, residential facility or separate school (OSEP, 2019). Even though the U.S government has been formulating and implementing policies, such as IDEA, Section 504, Education for All Handicapped Children Act (EHA), and special education strategies, most of the SEN children are still not achieving their academic goals at a rate compared to their peers (NCD, 2019). Correspondingly, NICHCY (2019) and OSERS (2020) noted that concerns about the number of children who fail to get back to special education and poor accountability of meaningful outcomes such as self-efficacy and career outcomes associated with special education have also limited the efficiency of available pedagogical programs and policies for SEN learners. For that matter, the need to assess the efficiency of such strategies and identify their possible shortcomings which should be improved has grown in recent years.

### **1.3 Problem Statement**

According to NICHCY (2018), SEN learners have inclusion rights to be involved in both the society and school settings of the mainstream or blended school system. However, such a goal has not been perfectly achieved because of limited educational resources to support SEN learners within the mainstream school sector; hence forcing most of them to enroll in special schools. In line with the arguments by the US Department of Education (2017), SEN learners have a right to be included in the mainstream school system as an approach for improving their social skill development, but also have a right to appropriate and personalized educational services like those provided in the special schools. In line with the explanations by the US Department of Education (2016), the beginning of actual inclusion of SEN learners in the mainstream schools involves the development of communication skills for all students and that the pedagogical approaches to be used in such settings should not only focus on teaching the learners how to read and write but also the development of their behavioral and social skills.

Contrary to the traditional pedagogical approaches which mainly applied the Gardner's Theory of Multiple Intelligences required to address the hearing, visual and tactile-kinesthetic learning strategies in order to help the SEN learners achieve their academic and social goals. Besides, NCD (2019), OSEP (2019), and US Department of Education (2016) identified challenges subject teachers such as identification of learners who are at risk of SEN, meeting the educational and social needs of all learners in the classroom including high achievers, middle ground and those with SEN, successful completion of curriculum necessities as well as engaging with parents and developing a positive learning environment within a mainstream or blended classroom setting. According to the US Department of Education (2017), teachers and school district management have the responsibility of establishing a holistic approach for helping the

development of all students, regardless of their educational needs by taking into consideration the educational, environmental, social, cognitive, economic, functional, health and vocational impacts on students' lives. Nonetheless, transition rates of SEN learners from preschool to primary, primary to secondary, and secondary to higher education have been relatively low mainly because of unsupportive learning environments.

#### **1.4 Purpose of The Study**

Within the special school setting, all the teaching and learning activities are personalized to address the educational needs of SEN learners (NCD, 2019). The teaching process is matched closely to the learning styles and strengths. Additionally, the US Department of Education (2019) noted that the SEN children in special schools are often grouped with their peers who share similar educational needs; hence enabling them to develop a sense of belonging. However, critics of special school systems argue that placing the SEN learners in the same classroom may limit their educational progress and that some education classes, including the separate classrooms and resource rooms, have been disparaged for a watered-down curriculum (Kauffman et al., 2018). Therefore, this systematic review aims at evaluating the efficiency of teaching and learning practices that are utilized within the special education system and determine their ability to address the needs of the SEN learners. As an alternative for addressing the limitations of special school systems, there have been recommendations to include the SEN learners in mainstream or blended school system. However, the inclusion of SEN learners in the mainstream school system has also been criticized for its inability to support such children because of inadequate resources to support their needs. The principal goal of this research paper is to evaluate the efficiency of available teaching and learning methods targeting children with special educational needs, either within the special schools or mainstream school system.

## **1.5 Significance of The Study**

Following successful identification, evaluation, and synthesis of research results from previous studies, the generated outcomes would then be used for creating a summary of current evidence about the teaching and learning (pedagogical) practices for SEN learners that can contribute to the evidence-based teaching practice. Even though the number of research studies about the most appropriate teaching and learning strategies for SEN learners has increased in recent years, each of those studies often generates varying types of evidence, which calls for the need to collect and assemble such evidence in a single document for easy interpretation and use in improving the efficiency of special education programs. Knowledge generated from this systematic review of the literature would be used for developing highly sustainable teaching and learning strategies personalized for students with special education needs as well as contribute to the establishment of inclusivity in the education sector.

## **1.6 Research Questions**

- Which types of pedagogical approaches have the greatest impacts on the intellectual development of the SEN learners?
- What types of teaching and learning strategies have better outcomes for SEN learners in mainstream schools?
- Which strategies can schools use to best achieve a transition from early years to school and reduce negative effects on SEN learners?

## **1.7 Research Aim and Objectives**

### ***1.7.1 Research Aim***

The primary aim of this paper is to systematically review and report evidence from previous studies on the most effective teaching and learning methodologies for SEN learners in

the 21<sup>st</sup> century and beyond. New knowledge generated from this study would be used for developing effective and sustainable pedagogical approaches for special needs learners.

### ***1.7.2 Research Objectives***

- To evaluate and report the challenges faced by the SEN learners both in the special school and blended classroom settings.
- To assess the level of preparedness among the special schools and mainstream schools in relation to offering quality educational services to SEN learners.
- To compare and contrast efficiency of available pedagogical approaches targeting the SEN learners.

### **1.8 Assumptions and Scope**

A systematic review of literature should always be conducted as a collaborative activity by individuals knowledgeable in the evidence-based methods as well as those with a high level of expertise in the research phenomenon of interest (Ferrerias-Fernández et al., 2016; Larsson & Brandsen, 2016). Furthermore, formulation of systematic review protocol, refining phenomenon of interest, performing a literature search for relevant evidence, selecting appropriate studies based on the applied inclusion and exclusion criteria, critically appraising evidence from those studies, and interpreting generated results often involves the application of specific assumptions (Coates, 2020; Wolgemuth et al., 2017). Specific to the present review, it was assumed that the participants included in the studies selected for review were highly qualified and expressed comprehensive lived experience about pedagogical strategies for learners with special needs. Moreover, it was assumed that the participants truthfully and precisely answered the interview questions and questionnaires based on their personal experiences and provided information collected for analysis based on their individual abilities. Another important assumption in this review is that the authors

of the selected studies for review were experienced researchers with lived experiences about the research problem under investigation.

As defined by de FSM Russo and Camanho (2015), the study scope clarifies the degree to which the research phenomenon is explored in the work and specifies the constraints within which the study operates. The present systematic review of literature employs a wide methodological scope as it targets to include studies that have adopted quantitative, qualitative, and mixed methods approach so as to increase the diverseness of evidence to be collected for review. Therefore, there is no specific limit in the number of participants that a study should have in order to be selected for review. Nonetheless, all the studies must provide evidence about special education pedagogical approaches and narrow their geographical location to the United States education sector in order to be considered for selection.

### **1.9 Organization of The Research Paper**

The present systematic review of literature is organized into five chapters: introduction, research methods, literature search results, discussion, and conclusion and recommendations. Following a successful description of the research aim, purpose, and significance in the introduction section, the second chapter (research methods) identifies and justifies the selection of methods and methodologies employed during the literature search process on the selected databases, keywords employed in addition to the inclusion and exclusion criteria applied. Thereafter, the outcomes from the literature search process are presented in the third chapter. The chapter also provides a summary of the selected studies based on their aim, methodologies, results, limitations, and implications to the present review. Outcomes from the quality evaluation of the selected studies for review are also presented in this chapter.

In the fourth chapter (discussion), themes generated from the reviewed studies are discussed and interpreted in order to facilitate the development of new knowledge that is used for answering the research questions. Evidence from the selected studies is also compared and contrasted in this chapter. The last chapter is divided into two main sections: conclusion and recommendations. Specifically, the conclusion section involves restating the research questions in order to determine whether the key purpose and objectives of this review are met. Additionally, limitations of the present review are also described in this chapter. The recommendations section is further divided into two sections: recommendations for education practice, which explains how the generated knowledge can be used for improving the efficiency of pedagogical practices for SEN learners, and recommendations for future research, which highlights the key areas which can be improved by future research in this area.

## **CHAPTER TWO: METHODOLOGY**

### **2.1 Introduction**

In this chapter, methods employed during the literature search process and outcomes generated from such a process are provided and explained. The chapter also identifies and justifies databases selected for the literature search process. The other key purpose of this chapter is to explain the inclusion and exclusion criteria that were applied during the literature search process in order to facilitate the identification of the most relevant studies for review. The initial literature search is expected to produce many hits. Therefore, this chapter also explains how the identified literature would be screened for quality, such as abstract screening, in addition to how data from the selected studies would be extracted and presented for review. The inclusion and exclusion of studies identified from the literature search process would be diagrammatically presented using the PRISMA diagram. Additionally, the extraction of data from the selected studies for review would be executed using a summary table.

### **2.2 Methodology Selected for this Study**

The present study adopted a systematic review of the literature to generate new knowledge that may be used for understanding the most appropriate pedagogical strategies for students with SEN and increasing the efficiency of special education in the United States. According to Bearman et al. (2016), a systematic review involves a critical and reproducible summary of the outcomes from different publications on a specific subject area or research question. The selection of systematic review over other types of methodologies was influenced by the availability of a large number of studies that have focused on assessing and reporting the most appropriate forms of pedagogical approaches for the SEN students and for increasing the efficiency of special

education. In line with the explanations by Crowther et al. (2017), a systematic review is often designed in order to provide a thorough summary of the current knowledge which is pertinent to the research phenomenon under investigation. For instance, systematic reviews involving randomized controlled trials are considered as a significant way for informing evidence-based literature and that conducting a systematic review is relatively quicker and cheaper compared to performing a new study.

In order to increase the generalizability of generated outcomes from this systematic review, all primary methodological designs were considered for selection and critical appraisal. As stated by Bearman et al. (2016), systematic review often utilizes a thorough and transparent strategy for research synthesis with the intention of evaluating and minimalizing bias in the results. Therefore, this systematic review intends to collect evidence from different studies on pedagogical approaches for special education and present them in a single document for easy access and use in the development of policies for ensuring inclusive education is realized. Despite the appropriateness of this approach for the present research phenomenon, Bearman et al. (2016) and Crowther et al. (2017) argued that the systematic review has some limitations which might interfere with the quality of outcomes. For example, the researcher assumes that data analyzed in the studies selected for review are authentic which may lead to the development of misleading information if the primary research studies were not properly conducted. Prior to conducting the actual systematic review, the researcher is required to identify databases for literature search, formulate keywords and search terms for easy retrieval of the relevant studies in addition to design literature selection criteria that would be used for choosing the most appropriate studies for the review (de FSM Russo & Camanho, 2015). Specific to this study, all the parameters highlighted by de FSM Russo and Camanho (2015) were applied. Within the education sector, a systematic

review of literature is used for creating new knowledge that may be used for developing evidence-based policy and practice.

### **2.3 Literature Search Strategy**

Aromataris and Riitano (2014) and McGowan et al. (2016) defined a literature search strategy as a systematized structure of key terms that are employed during the database search, and it syndicates the crucial concepts of the search question with the intention of facilitating retrieval of accurate results. The process for selecting the most appropriate literature for this review was established based on the PRISMA approach as described by Vrabel (2015). A review protocol that clearly defines review question and inclusion criteria for studies to be appraised provides a detailed foundation for the literature search strategy (Vom Brocke et al., 2015). Before embarking on the actual literature search, systematic reviewers must understand the review question and the types of information required for bridging gaps in the literature. With reference to the fact that there are many previous studies conducted with the field of education, it was important to develop a literature search process that would facilitate the identification of studies that have assessed the pedagogical strategies for students with SEN from the United States. In order to realize this goal, all the databases selected, keywords to be used for literature search as well as the literature selection criteria to be used for selecting the most appropriate studies must facilitate the realization of homogeneous outcomes.

According to McKeever et al. (2015) and Vom Brocke et al. (2015), every database often works differently hence systematic reviewers have the responsibility of developing a literature search strategy specific to a given database. Consistent with such recommendations, a systematic reviewer in this study developed a number of separate search strategies specific to different databases hosting educational and pedagogical literature. Furthermore, Vom Brocke et al. (2015)

recommended the need to pretest the literature search strategy and refine the keywords and terms before embarking on the actual search process as an approach for improving the quality of outcomes to be generated and studies selected for review. In addition to the keywords and search terms, other techniques such as truncation, wildcards, and adjacency searching were also applied. Truncation, or stemming, is a technique applied during the literature search process to broaden the search and allows for the inclusion of different word endings and spellings (McKeever et al., 2015). Specific to this review, the truncation technique was used by placing an asterisk (\*) at the end of every keyword in the search box hence allowing the databases to generate results that include any ending of the root word. For example, the keyword “special education learners\*” allowed for the inclusion of studies that involving learners with autism, hearing impairment, emotional disturbance, and orthopedic impairment among other forms of disabilities that limit the efficiency of the learning process. Generally, adjacency searching, wildcards, and truncation symbols performed a similar role in broadening the search process.

#### **2.4 Keywords and Search Terms**

The first formal step in every literature search process is to determine any alternative keyword, terms, or synonyms for the identified concepts within the logic grid (Guo et al., 2018). Keywords or search terms are words keyed into the search boxes of the database to facilitate retrieval of preferred types of studies for review (Mourão et al., 2017). The comprehensiveness of keywords or search terms used often determines the quality of studies to be identified for review and excellence of generated knowledge from such reviews. Therefore, failure to identify the right keywords may limit the ability of a systematic reviewer to retrieve the required articles. As stated by Guo et al. (2018) and Mourão et al. (2017), a comprehensive search strategy should be made up of both keywords and index terms in order to allow the bibliographic databases to describe

contents of each publication using controlled vocabulary – which is mainly a list of standard terms which group articles with reference to their contents. Nonetheless, it is important to note that such terms often vary from one database to another. The search process was further broadened using Boolean operators such as “AND” and “OR”. Keywords and search terms used in this review of literature are presented in Table 2 below.

**Table 2:** Keywords and Terms Used During the Literature Search Process (Author, 2020)

<b>Population</b>	<b>Intervention</b>	<b>Comparison</b>	<b>Outcomes</b>
Special education Learners with special education need Special education needs and disabilities Autistic learners/autism Deaf-blindness Deafness Emotional disturbance Auditory impairment Psychological retardation Multiple disabilities Orthopedic impairment Special learning disability Language impairment	Online learning techniques Computer-supported learning Technology supported learning Information communication technology supported learning Emerging pedagogy	Traditional learning techniques Teacher-centered instruction Direct instruction and lectures Seatwork Learning through listening and observation	Academic performance Inclusivity Equality Blended learning system Mainstream education Quality education

## 2.5 Databases for Literature Search

The contents of a database are indexed, organized, and searchable by using controlled vocabulary which helps in making the search process more precise compared to a search engine on the internet (Mijnhout et al., 2020). There are different reasons for conducting a literature search, the most important with the most motive being to draw information for making evidence-based guidelines (DeLuca et al., 2018). The quality of literature selected for review and appropriateness of the generated evidence from the review largely depend on the types of databases that were searched (Paez, 2017). Therefore, it is important to select databases with a high reputation for indexing literature within the subject area of review. Specific to the present study, the databases must be known for hosting reputable and peer-reviewed studies on education and pedagogical methods in order to be selected for literature search.

Generally, there are two categories of databases – subject-specific and multidisciplinary databases (Brocke et al., 2019). While the subject-specific databases focus on a single area, multidisciplinary databases are known for hosting literature from various disciplines (Hart, 2015). Therefore, the multidisciplinary databases are a good place to initiate the literature search process if the reviewer is not aware of where the review topic may fit. One of the most important tools used for this purpose is Thoreau (Paez, 2017). Even though the subject area of the review topic for this study was known (special need education), both multidisciplinary databases and subject-specific databases were searched in order to generate more comprehensive search results on the literature on pedagogical strategies for special education programs and their impacts on learners with special education needs and disabilities. The databases selected for the literature search in this review include Education Full Text (EBSCO), Linguistics and Language Behavior Abstracts (LLBA), and PsycINFO via ProQuest.

### ***2.5.1 Education Full Text (EBSCO)***

The selection of the Education Full Text database was appropriate for the present review as it would enhance retrieval of high-quality, reputable, and peer-reviewed studies on the efficiency of different pedagogical approaches for learners with SENs. In the first search lane the term “special education needs” was keyed in, a process that generated 2814 hits. The search process was further narrowed down by including additional keywords and search terms “special learning disability”, “online teaching/learning”, “computer-supported learning” and “blended learning system” in the second, third, fourth, and fifth literature search lanes, respectively, leading to the generation of 1501 hits.

Boolean operator “OR” was used for joining search lanes 1 and 2 while “AND” was used for connecting the second, third, fourth, and fifth search lanes. The search results were further refined by checking scholarly (peer-reviewed) journals and full-text boxes on the left side of the database search page. Additionally, the publication dates for articles to be included were limited to the last ten years (2011-2021), an approach that was necessary for ensuring the identification and selection of the most recent articles about the review topic. All these criteria produced 978 hits. On the left side of Education Full Text database, limiter “academic journals” was checked in order to include only literature published in reputable journals as results. Furthermore, the options “mainstreaming in special education”, “special education” and “inclusive education” were selected under the subject category on the left side of the database search page, leading to the production of 148 hits. Under the “Select a Field” option on the right side of the second and third literature search lane, options “TX All Text Fields” and “AB Abstract” were selected in order to make the search process more specific. A total of 7 results were produced from this search process, which

later subjected to manual assessment of the contents and leading to the identification of 3 studies for review.

### ***2.5.2 Linguistics and Language Behavior Abstracts***

The selection of Linguistics and Language Behavior Abstracts database is appropriate based on its high reputation of hosting top-quality literature on educational leadership, management, and administration as well as educational research such as special needs education which is the core area of the present review. On the LLBA homepage, the “advanced search” option was selected so as to widen the literature search process and lead to the identification of more comprehensive search results about the research problem. Under the advanced search category, the “thesaurus” option was selected. The approach was also necessary for widening the search process and including all relevant literature about special education teaching and learning methods. On the search box, the term “special education needs” was keyed in. Thereafter, a blue box next to the first result under the “subject terms found” was selected. The approach is necessary for providing the reviewer with additional information about the search term. The produced additional search terms generated from this process include “special education inclusion”, “special needs and disabilities”, “mainstream/blended learning”, “technology supported learning” and “emerging pedagogy”.

However, this approach failed to generate specific literature to be included for review. Therefore, on the “Advanced Search” page, the “Command Lane” option was selected. The search terms “special education”, “special needs students”, “special education pedagogy”, “technology supported learning” and “blended learning/ mainstream education” were keyed into the first to five search lanes in that order. All the search lanes were connected using the Boolean operator “AND” in order to ensure that the retrieved publications contain the search terms or their alternatives. The

asterisk (\*) was placed at the end of each search term to include their alternatives during the search process. Additionally, in all the additional search boxes on the right side of each lane, “Abstract - AB” was selected in order to include only publications with the key terms in their abstract sections. Thereafter, the search box was selected, leading to the generation of 1612 hits. Under the “sorted by” command on the left side of the search page, the “relevance” option was selected. The strategy helped in excluding publications that are not relevant to the literature review question and making the search process more specific. The “modify search” command on the right side of the search page was then selected in order to filter results based on the preferred characteristics. Additionally, the search results were restricted to peer-reviewed publications, published in English language, the publishing year 2011-2021, and full text available. A total of 14 studies were acknowledged in this process, but only 3 were selected for review after manual assessment of their contents.

### ***2.5.3 PsycINFO via ProQuest***

The selection of PsycINFO as a database for literature search in this review was influenced by its high reputation of hosting top-quality and peer-reviewed literature on psychology and mental health problems. Even though some of the SEN learners have physical disabilities, most of the special education needs are influenced by mental health problems which is a key specialization for the PsycINFO database. The search process was initiated by conducting a basic search on the PsycINFO homepage by keying the search term “special education learners” into the search box, a process that produced 1703 hits. Explicitly, this was a preliminary process for determining whether the PsycINFO hosted publications relevant to the planned review. Thereafter, an advanced search command on the PsycINFO homepage was selected. In the first search lane, keyword “special education needs” was keyed in, with an option “anywhere” on the right-side box being

selected in order to allow the database to retrieve publications from different sources. A total of 1879 hits was generated.

On the second search lane “Special learning disability\*” OR “learners with special education need” were keyed in and connected to the first lane using a Boolean operator “AND”. The search process produced 1409 hits. On the left side of the search page, parameters such as peer-reviewed, publication language (English), publication date (2011-2021), and academic journal options were selected in order to increase the relevance of search results. A total of 317 hits was recorded at this stage. Based on the fact that the generated search result was still large, an option “modify search” was selected in order to add more search lanes and search terms. In the third search lane, key terms “emotional disturbance” OR “speech/language impairment” were keyed in. In the fourth search lane, key terms “technology supported learning” OR “emerging pedagogy techniques” OR “online learning techniques” were inserted. 13 studies were retrieved after the execution of this search technique. However, only 4 studies were selected for review after manual assessment of their full texts, abstracts, and contents.

## **2.6 Inclusion and Exclusion Criteria**

Inclusion and exclusion standards are a set of measures that determine the selection or omission of studies during the literature search process (Patino & Ferreira, 2018). Specifically, these measures are often determined after the formulation of the research questions and prior to performing the actual literature search process (Stern et al., 2014). However, Aromataris and Pearson (2014) advised that the reviewers might consider conducting scoping searches prior to the determination of the appropriate criteria. Key parameters that are considered during the inclusion and exclusion criteria development include data and language of publication, exposure of interest,

participants and their geographic location and research methodology, and nature of the study. For a study to be selected for review, it must meet all the outlined inclusion criteria.

### ***2.6.1 Inclusion Criteria***

The first parameter used for developing the inclusion criteria for this review is the target population. The present review targeted learners with special educational needs students. Therefore, only studies that focused on SEN learners or special education would be selected for review. The studies must include any of the special needs defined by IDEA (listed in Table 1). The inclusion of studies that only focused on SEN learners was necessary for ensuring homogeneity of collected evidence and outcomes from the review. According to Aromataris and Pearson (2014), studies selected for review must have a common target population, aim, and purpose so that the generated knowledge can be generalized to the wider members of the population. The study aim is another criterion applied during the literature search process. Only those studies that assessed and reported various teaching and learning methodologies for SEN learners were considered for review. Precisely, this approach was necessary for ensuring that only studies that present evidence that could be used for answering research questions for the present review are included.

Additionally, reported outcomes of the studies were assessed before considering them for inclusion in the review. In line with the explanations by Stern et al. (2014), developed inclusion standards must specify the types of outcomes that a study must report so as to be selected for review. In the present review, the impacts of pedagogical approaches on SEN learners' academic performance were the primary outcomes targeted. However, study outcomes might be omitted if they are self-reported rather than using objective procedures to determine the appropriateness. Specific to the present review, only those studies that reported outcomes such as academic performance for SEN learners, inclusivity and equality in education, the efficiency of the blended

learning system, the effectiveness of mainstream education, and impacts of modern pedagogical approaches on the quality of special education. The outcomes must be generated from the analysis performed on the collected data and their efficiency measured.

Moreover, the geographic location and settings of the study were also considered during the selection process. The present review only focused on teaching and learning methods for SEN learners within the United States and any study which included SEN learners from other countries was to be excluded from the review. Different countries have varying approaches for ensuring inclusivity and providing quality education to SEN learners. The present review is targeted to generate knowledge that may be used by the US Department of Education, School Districts among other special education organizations in the United States to develop effective and sustainable pedagogical approaches for SEN learners. The study design is another inclusion criterion parameter that was applied. The inclusion of studies with specific designs is an important approach for making the review more manageable and applicable to the research question (Patino & Ferreira, 2018). In this review, only studies that involved collection and analysis of primary data (both qualitative and quantitative) were shortlisted for selection into the review.

The last parameter applied is the type of publication. Systematic reviews usually search for original studies that most recent evidence about the research problem (Patino & Ferreira, 2018). Specific to this review, the search commands such as publication year (2011-2021), publication language (English), academic journals, and peer-reviewed studies were checked in order to ensure identification of literature which high-quality evidence about the pedagogical techniques for SEN learners. Inclusion of only studies published in 2011-2021 was to ensure the selection of literature with up-to-date evidence about the research problem. Even though Stern, Jordan, and McArthur (2014) noted that reviewers can always use translation services to decode study contents from one

language to another, Aromataris and Pearson (2014) conversely argued that translations services might interfere with the quality of the study as some contents may not be perfectly translated. Based on such limitations, translation service was not used in this appraisal and only studies formerly published in English were selected for review. Peer review has become an important basis of the academic periodical system by setting standards that studies need to meet in order to be accepted for scholarly use (Stern et al., 2014). Through a peer-review approach, works of individual authors are scrutinized by other scholars in the field as a strategy for improving the quality of their evidence. Therefore, the inclusion of peer-reviewed and primary literature was necessary for ensuring the generation of high-quality outcomes from the review.

### ***2.6.2 Exclusion Criteria***

Legitimacy and consistency of literature selection standards help in minimizing selection bias, random errors, and confounding hence improving the likelihood of generating a relationship between exposure or intervention and the outcomes (Stern et al., 2014). Together with the inclusion criteria, the development of inclusion criteria is guided by a systematic goal of the study and has important consequences for the methodical rigor of the research in addition to the assurance of ethical principles (Patino & Ferreira, 2018). Exclusion criteria for this review were developed various parameters such as study population, methodologies employed, reported outcomes, and types of publication. Specific to the target population, those studies that included students from deprived areas, learners from poor and ethnically minority backgrounds were excluded from the review. Even though factors such as poverty and originating from marginalized areas may negatively impact students' academic performance, the effects of such factors were not the basis of this review. The studies that failed to include learners with special educational needs (as defined by IDEA) were not selected for review.

Additionally, those studies that focused on assessing the factors increasing vulnerability of students develop special educational needs, impacts of special educational needs on their social and psychological health were excluded from the review. The inclusion of such studies would interfere with the homogeneity of evidence to be reviewed and knowledge to be generated from the review. In terms of methodologies, studies that adopted secondary methodological approaches such as systematic reviews and meta-analyses were excluded from the review. According to Aromataris and Pearson (2014), secondary data might not be specific to the research needs as it was collected in the past for another reason which might be different from the primary objective of the review to be performed. Furthermore, non-peer-reviewed and grey literature such as administrative reports, policy statements and issue papers, conference proceedings, dissertations, research reports, and fact sheets were excluded from the review because of their perceived low-quality evidence.

## **2.7 Literature Quality Assessment**

The quality of literature identified from the three database search processes was evaluated using the Newcastle-Ottawa scale (NOS). According to Stang et al. (2018), the NOS tool is used for evaluating the quality of nonrandomized literature and interpretation of the systematic review and meta-analytic results. NOS tool assesses the quality of selected studies for review based on three perspectives: selection process of the study groups; comparability of the groups and nature of the outcomes registered. Besides, Moskalewicz and Oremus (2020) and Stang et al. (2018) noted that the content soundness of NOS has been developed based on the critical appraisal of items by different experts in the field who have appraised its clarity and extensiveness for a specified task of evaluating studies' reputability for their inclusion in systematic review or meta-analysis.

Despite its extensive use in quality assessment of systematic review studies, evaluation of NOS is currently under progress. Furthermore, the content validity and inter-rater reliability of this tool have been established (Moskalewicz & Oremus, 2020). Although the criteria for validity with comparisons to more comprehensiveness of NOS have been established, its cumbersome scale and interrater reliability are still being examined (Luchini et al., 2017). The NOS tool is made of three sections: selection, outcome categories, and comparability. A research paper can be allocated one star on items under the first two sections: selection and outcome categories. Conversely, a study can receive a maximum of two stars under the comparability section. For a study to be included for review it must register 8 points out of 10 points.

## **2.8 Chapter Summary**

The chapter has successfully explained methods and methodologies executed during the literature search process and justified their selection. The key areas that have been addressed in this chapter include literature search strategy, keywords and search terms employed, databases selected for literature search, and the inclusion and exclusion criteria for selecting the most appropriate studies for review. The selected databases include Education Full Text, Linguistics and Language Behavior Abstracts, and PsycINFO, with their choice being influenced by a high reputation in hosting top quality and up-date literature about special education and emerging pedagogical techniques. Some of the key inclusion criteria applied in this review include publication date (2011-2021), publication language (English), targeted population (special education needs learners), and purpose (improving academic performance and inclusivity of SEN learners). Six studies (three from each database) were selected for review from Education Full Text and Linguistics and Language Behavior Abstracts databases. In PsycINFO, four studies met all the inclusion criteria. Therefore, a total of 10 studies were selected for review. In the next chapter,

outcomes from the literature search process would be presented, their quality appraised, and then the selected studies summarized based on their aims, methodologies, results, implications, and generated themes.

## **CHAPTER THREE: LITERATURE SEARCH RESULTS**

### **3.1 Introduction**

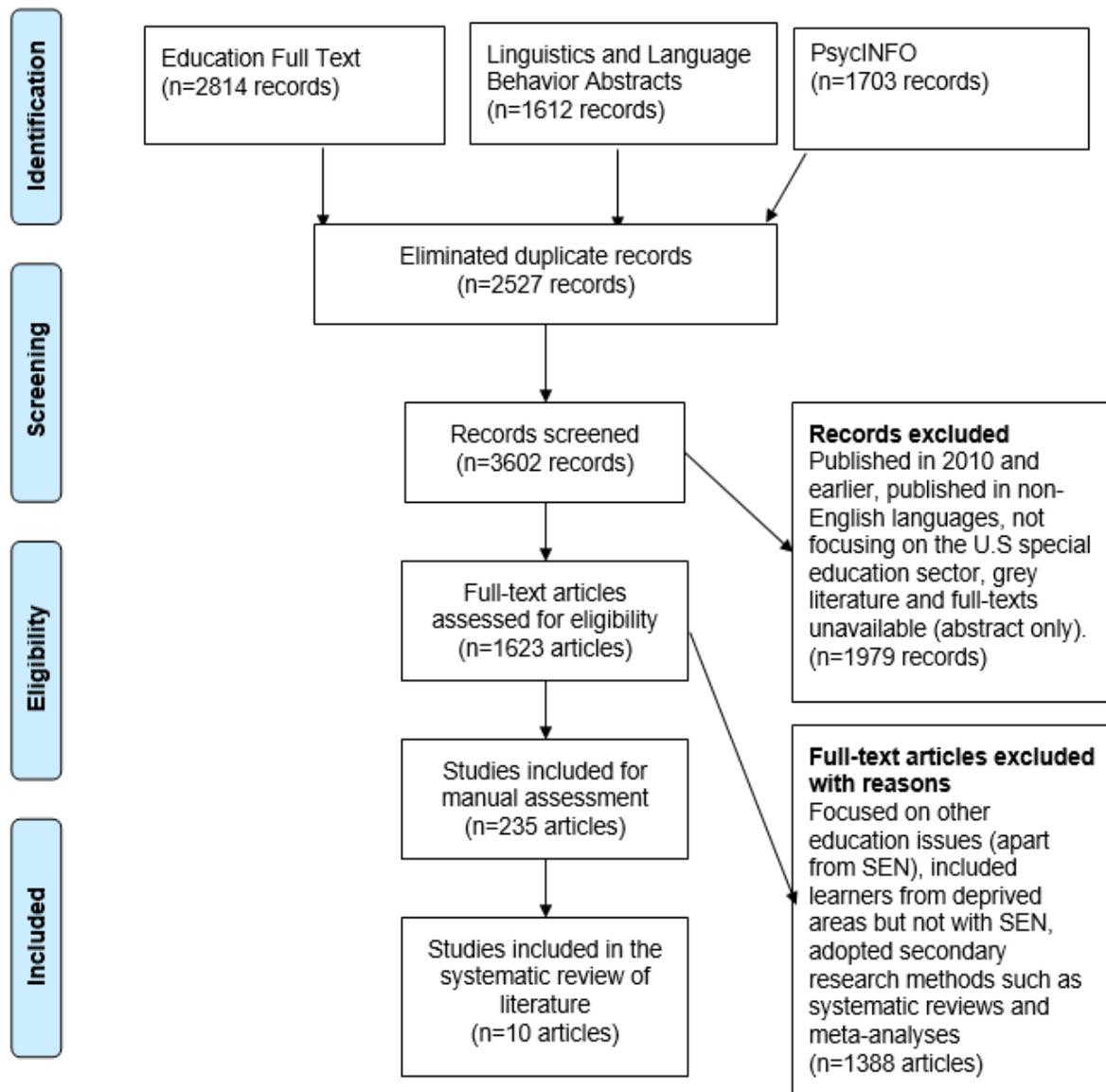
The primary purpose of this chapter is to present outcomes from the literature search process. The chapter would describe how the inclusion and exclusion criteria were applied during the selection and elimination of literature identified from the literature search process by using a PRISMA diagram. Furthermore, this chapter critically appraises the quality of studies selected for review by using the NOS tool where strengths and limitations of such studies are assessed. Additionally, the chapter provides a summary of all studies selected for review by reporting their authors, methodology, results, implications to the present review, and limitations by using a summary table.

### **3.2 Literature Selection Process**

The literature selection process was made up of four stages; identification, screening, eligibility, and literature inclusion. The initial literature search process produced a total of 6129 hits with the Education Full Text, Linguistics and Language Behavior Abstracts, and PsycINFO databases producing 2814 hits, 1612 hits, and 1703 hits respectively. However, all the search results could not be included in the review as some had evidence irrelevant to the context of the present review. Therefore, inclusion and exclusion criteria were applied in order to identify the most appropriate set of studies. The first step was to eliminate duplicates reported during the search process: this led to the elimination of 2527 hits. The remaining 3602 hits were assessed for relevance. In the screening stage, 1979 records were excluded based on different parameters such as published in a non-English language, published in 2010 and earlier, literature not in the U.S context, non-peer-reviewed literature/grey literature such as government reports, policy statements

and issue papers, conference proceedings, pre- and post-prints of the articles, dissertations and theses, research reports, newsletters and bulletins and fact sheets, and those with only abstracts available.

The remaining 1623 records were then assessed for eligibility and relevance to the study. At this stage, full-text articles were scrutinized based on their aims, results, participant population, and methodologies applied. Explicitly, 1388 full-text articles were excluded on the basis of not focusing on the topic of interest, included learners from deprived areas but not with SEN, included SEN learners but not pedagogical techniques appropriate for the group, adopted secondary research methodology approaches such as systematic review of literature and meta-analysis. The remaining 235 records were then manually assessed for their relevance to the present review: 225 records were eliminated and the resulting 10 articles were selected for review. PRISMA diagram in Figure 2 below describes the literature selection process and results at each stage.



**Figure 2:** PRISMA Diagram for the Literature Selection Process (Author, 2021)

### 3.3 Summary of the Literature Selected for Review

**Table 3:** Literature Matrix (Author, 2021)

<b>Author</b>	<b>Research Aim</b>	<b>Methodology</b>	<b>Results</b>	<b>Implications to the Review</b>	<b>Limitations</b>	<b>NOS Score out of 10</b>
An and Reigeluth (2011)	To assess the belief and perception of K-12 teachers about technology-enhanced, learner-centered classrooms for SEN learners.	An online survey approach involving 126 K-12 was employed.	Technology has enhanced the learning process for SEN learners even in blended classrooms.	All academic stakeholders such as teachers and parents of SEN learners should be consulted during the formulation of learning tools for SEN students.	The only perception of teachers was analyzed. There was no direct observation of the learning process within the SEN classroom or blended classroom.	8
Bauminger-Zviely et al. (2013)	The research is aimed at examining the efficiency of a school-based,	Computer programs were used in the intervention.	Technology has enhanced the actual social engagements of	Parents and teachers of children with autism should be engaged when	Only two computer programs were included in the intervention and there	9

	collaborative technology approach integrated with cognitive-behavioral therapy.		children with SEN (autism)	coming up with set-ups for such students.	was a problem in teaching conversation.	
Ciullo, Falcomata and Vaughn (2015)	To evaluate the impacts of a single-case, multi-probe design investigation for children with learning disabilities in grades 4 and 5.	7 schoolchildren with learning disabilities and constant disability from two elementary schools were used.	There was an improvement in both students on pre/post social studies measures while in another school students made greater gains at post-test.	Academic stakeholders should be engaged when creating such designs for students with learning disabilities.	Treatment was only conducted in secondary schools and assumed to be effective to students in grades 4 and 5.	9

Fernández-López et al. (2013)	To enhance behavioral development among SEN children and have difficulty in developing cognitive abilities and acquiring new knowledge.	Use of devised mobile platforms based on iPod and iPad devices to cover main levels of the learning process.	There was the development of positive effects of learning skills for children who have special educational needs and they also have the opportunity to perform activities.	The type of study that was suggested provided suitable learning purposes to students with impairments as well as their teachers and parents.	Students with special education have difficulty in creating cognitive abilities as well as acquiring knowledge.	8
Haydon et al. (2012)	To use alternating treatment designs to assess impacts of worksheet condition and iPad condition on the eloquence of	Three participants in independent seatwork were used to complete problems on	More math problems were solved currently by the students based on the visual analyses.	The teacher and student validity assessment preferred to use the iPad condition to worksheet conditions.	Worksheet condition problems were not solved properly compared to iPad problems.	9

	math and active academic assignment.	worksheets or complete problems on an iPad.				
Marino et al. (2014)	To examine the performance of 57 schoolchildren with SENs from 4 middle schools.	There was an alternative to the use of traditional and curricular materials supplemented with video games to align Universal Design for Learning guidelines.	Video games and supplement texts were efficient as they provided the students with several expression and representation means.	Alignment of the Universal Design for Learning increased levels of student engagement.	There was no substantial difference in post-test grades when learners with learning disabilities were compared with those without learning disabilities.	9

Okolo and Diedrich (2014)	To provide a snapshot of factors that are associated with assistive technology used in one large Midwestern state.	The study was conducted on the original Technology-Related Assistance Act.	Respondents used the technology frequently in their individual and professional lives but less during instructions of students who have disabilities.	Assistive technology brings a positive perspective to learners making them believe in the aspects of technology use.	There is a lack of knowledge concerning technology use by students in and out of school.	8
Reed, Hyman, and Hirst (2011)	To examine and report the impacts of using technology-based approaches to develop social skills among SEN learners.	Technology-based approaches had positive impacts on the social skills among the SEN learners.	Many studies depended on video in the delivery of intervention which was conducted in school set up and its target was more	There was the reliability of common social skills that enhanced the initiation of conversation that brought about playing skills.	There were common dependent variables thus making the independent variables infrequent.	8

			than one social skill.			
Reinke et al. (2011)	To examine teachers' perception of current mental health needs in their schools, skills, and training needs as well as their roles in supporting the mental health of children.	Teachers reported the views of school psychologists in having a key role in several aspects of mental health delivery.	The teacher's perspective to provide important information was understood through contextual influences.	Teachers were able to give themselves significant responsibility to implement classroom-based interventions.	Lack of global experience and training to support the needs of children with mental health.	8
Sermier Dessemontet and Bless (2013)	The research aims at assessing the impacts of children with intellectual disabilities in general	A quasi-experimental study was done on a group of 202 students in a	There was no significant difference found in the progress from classrooms	Children with intellectual disabilities in general education classes do not have negative impacts.	The progress of children with intellectual disabilities does not have an	9

	education classrooms.	class with a child with mild or moderate intellectual disability.	with or without children affected with intellectual disability.		impact on those without.	
--	-----------------------	---	---	--	--------------------------	--

### 3.4 Quality Assessment of the Selected Literature

5 of the 10 studies selected for review employed a qualitative research approach: the studies include Bauminger-Zviely et al. (2013), Ciullo et al. (2015), Fernández-López et al. (2013), Haydon et al. (2012), and Reed et al. (2011). The remaining 5 studies on the other hand adopted a quantitative research approach: An and Reigeluth (2011), Marino et al. (2014), Okolo and Diedrich (2014), Reinke et al. (2011), and Sermier Dessemontet and Bless (2013). With reference to the assessment section one of the NOS tools in Appendix 1, a study is supposed to be awarded one star if its sample truly represents the characteristics of the target population. Therefore, all the 10 selected studies in this review were awarded one star each as they included SEN learners or SEN teachers as their participants. For example, An and Reigeluth (2011) included 126 K-12 special education teachers, Bauminger-Zviely et al. (2013) included 22 children with high-functioning autism spectrum disorders while Okolo and Diedrich (2014) surveyed 1143 Michigan special needs educators. Therefore, outcomes from these studies could be used to understand the appropriate teaching and learning methods for special educational needs learners in a general or specific group of SEN students such as those suffering from autism, emotional disturbance.

The star award rate for the selected studies thereafter varied based on their quality. For example, An and Reigeluth (2011) was awarded 8 stars because it failed to meet two important assessment criteria outlined in the NOS tool. Even though the included sample size was relatively large (126 K-12 special education teachers), this study failed to describe the sampling criteria that were employed. Furthermore, An and Reigeluth (2011) analyzed quantitatively in order to understand the K-12 teachers' beliefs, insights, barriers, and support needs in the context of creating technology-enhanced, learner-centered classrooms, a goal which could have been successfully achieved using a qualitative research approach. Specifically, the quantitative design

uses closed-ended questionnaires that limit the inclusion of the personal perception of the participants about the research phenomenon.

Besides, the study by Bauminger-Zviely et al. (2013) was awarded 9 stars. Unambiguously, this study provided a comprehensive explanation of the research methods and methodologies it adopted. Contrary to An and Reigeluth (2011), Bauminger-Zviely et al. (2013) specified that they used a purposive sampling criterion for sample selection and recruitment. Instead of collecting from other education stakeholders, as in the case of An and Reigeluth (2011), this study primarily assessed the effectiveness of school-based collaborative technology intervention integrated with cognitive-behavioral therapy based on the data collected from children with high-functioning autism spectrum disorders. However, this study failed to register all possible ten stars because it included relative sample size and employed an observational approach for data collection which is prone to researchers' personal perception interference.

Similar to Bauminger-Zviely et al. (2013), the study by Ciullo et al. (2015) was also awarded 9 out of 10 stars. Explicitly, this study focused on assessing the impacts of a single-case and multiple-probe design investigation for students with learning disabilities in Grades 4 and 5. In order to collect appropriate data, Ciullo et al. (2015) included seven students with learning disabilities as participants, and the learners were recruited from two elementary schools so as to enhance comparison. The approach was necessary for ensuring the representativeness of the sample, quality of collected data, and assessment of generated outcomes. However, Ciullo et al. (2015) failed to outline key ethical considerations that were applied and specify the ethical committee that approved this study based on the fact that it involved the collection of data from minors. Therefore, this study failed to pass the ethical assessment criteria of the NOS tool which is often awarded one-star maximum.

Fernández-López et al. (2013) was awarded 8 stars after failing to NOS quality assessment criteria of comparability. A study is awarded all the two stars under this criterion if it compares it compares and contrasts outcomes from two participant groups. Even though Fernández-López et al. (2013) assessed and reported the efficiency of mobile learning technology for supporting SEN learners (which is part of the present literature review aims), it failed to appraise the efficiency of such technology on the non-SEN learners. Despite this limitation, this study designed a mobile platform for teaching SEN learners incorporating all kinds of educational activities such as exploration, association, puzzle, and sorting hence improving the quality of evidence within the special education domain.

Even though the other quality assessment criteria such as availability of research aim statement and selection of appropriate qualitative methodology and design were met by Haydon et al. (2012), this study failed to describe possible relationships between researchers and participants. For a study to be awarded a star under this criterion, the researchers must critically examine their own role, potential bias as well as an influence during the formulation of research questions, data collection, sample recruitment, and research location selection. Haydon et al. (2012) stated that they used a convenience sampling approach but failed to specify the factors that influenced their decision to adopt this approach. Even though a multi-research approach made up of focus group discussion and visual analysis of collected data helped in improving the quality of generated data, Haydon et al. (2012) failed to mention possible forms of biases, such as selection bias, in their study.

Similar to the case of Haydon et al. (2012), Marino et al. (2014) also earned 9 stars even though the two studies adopted different research designs. The general structural organization of this article is appropriate. The study is made up of different sections such as abstract, introduction,

methodology, discussion, and conclusion hence providing the readers with the opportunity of understanding its contents. Another area that this article scored highly, compared to other studies such as Haydon et al. (2012), Fernández-López et al. (2013), and Bauminger-Zviely et al. (2013) is outcome comparability. In addition to including 57 students with learning disabilities recruited from four middle schools, Marino et al. (2014) adopted a follow-up approach to assessing the performance of selected students in one full academic year in their inclusive classrooms as they interchanged between the use of traditional curricular materials and materials supplemented with video games alternative print-based texts to more closely align with Universal Design for Learning (UDL) guidelines. The approach allowed for the collection of data within a longer period of time hence increase the comprehensiveness and appropriateness of such data.

In terms of the structural organization, the article by Okolo and Diedrich (2014) was perfectly structured into different subsections which makes it easier for the reader to comprehend its contents. Furthermore, Okolo and Diedrich (2014) have clearly stated the main purpose of their research study and developed a quantitative research approach that enabled them to achieve their research goals. Definitely, this study focused on providing a snapshot of factors that are linked with the assistive technologies that are used for enhancing academic performance among learners with special educational needs. A key strength of this study is that it employed a longitudinal research approach involving assessment of the efficiency of assisted technologies in the special education sector within a period of 25 years. Furthermore, a total of 1143 Michigan educators were included in the study, hence increasing the generalizability of the research outcomes. However, Okolo and Diedrich (2014) failed to register 10 stars because of two main issues. Firstly, the article failed to specify the inclusion criteria employed during the selection of study participants.

Secondly, Okolo and Diedrich (2014) did not provide a detailed account of the key developments within the assisted technology and its application in special education.

Correspondingly, the study by Reed et al. (2011) was also awarded 8 stars. Compared to other studies (such as Bauminger-Zviely, 2013; Haydon et al., 2012; Fernández-López et al., 2013), the article by Reed et al. (2011) specifically focused on assessing the pedagogical approaches relevant to the children with autism spectrum disorders, which is among the most common type of special educational needs in the United States. However, the generalizability of the outcomes generated from this study is limited because of two reasons; adoption of a qualitative research approach with a relatively small sample size and only including information about autistic learners. Therefore, these are the specific areas within which this study lost the two stars. Even though the study employed a valid empirical design, it failed to compare the efficacy between the studies through the calculation of the effect size. Therefore, the efficiency of generated outcomes could not be applied in a wider population of students with special educational needs.

In the last two studies, Reinke et al. (2011) and Sermier Dessemontet and Bless (2013), were awarded 8 stars and 9 stars respectively. While Reinke et al. (2011) adopted a qualitative approach, Sermier Dessemontet and Bless (2013) on the other hand employed a quantitative approach. With reference to the research aims, Reinke et al. (2011) assessed the perception of technology-driven teaching and learning approaches for students with mental health issues while Sermier Dessemontet and Bless (2013) examined the impacts of including children with intellectual disabilities within the general education classrooms on their academic achievements. Therefore, it is justifiable to note that the two studies had a relatively similar objective hence increasing homogeneity of the generated outcomes. Moreover, Reinke et al. (2011) included 292 teachers from 5 school districts in their study hence increasing the comprehensiveness of the

collected data. Precisely, Reinke et al. (2011) reported that most of the teachers perceived themselves as people with the primary responsibility to implement classroom-based behavioral interventions but also argued that school psychologists played a more important role in teaching social and emotional lessons to children with mental illness.

Contrary to the study by Reinke et al. (2011), Sermier Dessemontet and Bless (2013) adopted a quasi-experimental design involving both the treatment and control groups hence the data collected from each group could be compared and contrasted. The treatment group was made up of 202 students from classrooms with an included child with a mild or moderate intellectual disability while the control group was made up of 202 students from a classroom with no included children with special educational needs. In contrast to the study by Fernández-López et al. (2013) which involved the collection of data within a short period of time (2 weeks), Sermier Dessemontet and Bless (2013) assessed the progress of the treatment and control groups in their natural classroom settings within a period of the full school year. Therefore, data from Fernández-López et al. (2013) were less detailed and characterized by collection errors compared to those from the study by Sermier Dessemontet and Bless (2013). The selected 10 studies met all the selection criteria as well as earning 8-10 stars which was recommended for their inclusion.

### **3.5 Chapter Summary**

The chapter has successfully appraised the quality of articles selected for review. Out of the ten studies selected for review, five studies employed a qualitative approach, and the remaining five adopted quantitative designs. In terms of the NOS star awarding process, the studies were divided into two groups, 8-star and 9-star groups with each category made up of five studies. Even though these studies employed varying research methodologies, they have a common aim of assessing the efficiency of teaching and learning pedagogies for learners with special educational

needs. Following the successful identification and selection of ten studies for review, the next chapter involves critical appraisal of the evidence presented in these studies based on generated themes and developing new knowledge to be used for answering the research questions for this review.

## **CHAPTER FOUR: FINDINGS AND DISCUSSION**

### **4.1 Introduction**

In this chapter, evidence from the selected ten studies would be critically reviewed to facilitate the generation of new knowledge. The chapter is organized into themes describing the pedagogical strategies for SEN learners and their impacts on quality education within a blended school setting. The chapter also discusses possible limitations of the newly developed strategies for teaching learners with SEN. Eight pedagogical strategies were identified from the reviewed literature: cooperative learning, flipped classroom, design thinking approach, project-based learning, thinking-based learning, gamification, problem-based learning, and competency-based learning.

### **4.2 Findings**

#### ***4.2.1 Flipped Classroom***

Contemporary information society requires people with the ability to efficiently manage and utilize increasingly growing educational data to solve problems and make decisions in the face of uncertainty (An & Reigeluth, 2011). Even though special schools were developed as an approach for creating conducive learning environments for SEN students, the efficiency of this approach has been criticized because of segregation and discriminatory impacts on the special needs and disabled learners (Bauminger-Zviely et al., 2013). According to Bauminger-Zviely et al. (2013), the need to include students with SENs such as intellectual disabilities in general education or mainstream classroom setting is supported by different international conventions such as the United Nations Convention on the Rights of Persons with Disabilities, Salamanca Statement on Principles, Policy, and Practice in Special Needs Education among others. Within the special

education system, teachers have the role of modifying the lesson plans in accordance with the requirements of the learners with SEN (Ciullo et al., 2015). A key future of flipped education is that it acknowledges the unique needs of all learners which were never considered within the traditional learning approach.

A study by Sermier Dessemontet and Bless (2013) involving 404 learners (202 from classrooms with included SEN learners and 202 from classrooms with no included SEN learners) revealed that there was no statistically significant difference between the progress of low-, average- and high-achieving learners within the two classroom settings. Therefore, the blended approach or flipped learning technique enhanced uniform educational performance among the learners regardless of their educational needs. However, Sermier Dessemontet and Bless (2013) only included students with intellectual disabilities hence limiting the generalizability of generated outcomes to other groups of SEN learners.

Despite the positive impacts associated with the use of flipped pedagogical approach, Bauminger-Zviely et al. (2013) noted that this strategy is relatively new and most of its implementation processes are reported in non-academic literature such as blogs, newspapers, and online magazines. For that matter, there seems to be limited rigorous research that has been conducted in order to assess its efficiency within the special education setting. In line with the arguments by An and Reigeluth (2011), implementation of a technology-enhanced learning system (such as flipped learning approach) is often very challenging as some of the SEN learners lack basic knowledge about the technologies to be used. Therefore, the SEN teachers have the responsibility of creating technology-enhanced and learner-centered classrooms. In order to achieve required positive outcomes in a flipped learning setting, Ciullo et al. (2015) recommended

that the learners must be physically present in the class for the active learning process as well as being prepared for each session by watching the assigned video clips.

#### ***4.2.2 Project-Based Learning***

Teaching students with SEN is a very challenging process as their needs often vary from one student to the other. Consistent with Ciullo et al. (2015) and Haydon et al. (2012), some of the key challenges associated with teaching SEN learners include widespread lack of resources (including staffing and curriculum), overpowering levels of segregation, and unescapable alleged incompetence of students with SEN and disabilities. Evidence provided in the reviewed literature and US Department of Education affiliated documents identifies project-based learning as a key pedagogical approach for SEN learners. Project-based learning strategy advocates for more student-centered and experimental approaches to education with the primary aim of supporting deeper learning through active exploration of real-world problems and challenges (Sermier Dessemontet & Bless, 2013). Similarly, Haydon et al. (2012) noted that the learner-centered model addresses the personal domain which is mostly ignored in the traditional school and classroom settings hence leading to increased student motivation and learning.

Despite the positive impacts of project-based learning on students with SEN, the approach among other forms of student-centered strategies have been criticized mainly by those who capitalize on their weaknesses such as the inability to enable learners to develop specific content knowledge in the traditional subject areas. Nonetheless, Okolo and Diedrich (2014) and Sermier Dessemontet and Bless (2013) agreed to the fact that preference for project-based learning and other pedagogical approaches emphasizing deeper learning and establishment of skills required for a successful transition to higher education levels, career, and civic life has significantly increased in the recent years.

Despite the increasing percentage of SEN learners, there are still concerns regarding the ability of project-based learning to enhance their academic performance and social growth. Even though Fernández-López et al. (2013) assessed the impacts of technology-supported pedagogical approaches on quality education for SEN learners, they did not include any evidence regarding the effectiveness of project-based learning (which is often supported by educational technologies) for special education learners.

Though quantitative evidence about project-based learning's effectiveness on SEN learners is still limited, research studies by Okolo and Diedrich (2014) and Ciullo et al. (2015) theorized that this student-centered approach is among the imperative ways for addressing SEN students' individual learning needs within a blended classroom setting. Evidence about students with learning disabilities and technology use in secondary science classes shows that curricular within this subject area often fail to engage students with learning disabilities as a result of complex vocabulary and phenomenological constructs reported following the use of inaccessible media such as expository texts (Marino et al., 2014). Such ineffective pedagogical approaches have also led to increased poor performance among the SEN learners. For instance, Marino et al. (2014) claimed that most secondary science teachers often fail to precisely evaluate the knowledge and technical skills of the students at the beginning of inquiry activities. Even though the reviewed literature revealed that project-based learning can help SEN students to improve their academic performance and social skills, there is still a need for studies focusing on this pedagogical approach to compare the performance of SEN learners in project-based learning and non- project-based learning environments. Furthermore, the implementation of research literature needs to consider the experience of SEN learners and teachers within the project-based learning environments, with

specific attention to the opportunities and challenges associated with such design principles as supporting and self-directing inquiry.

### ***4.2.3 Cooperative Learning***

An important aim of the teaching-learning process is to help students achieve high grades, and it is the sole measure of learning in most cases (Bauminger-Zviely et al., 2013). In order to realize this goal, teachers often employ different pedagogical approaches such as lectures, discussions, and demonstrations. Ciullo et al. (2015) identified lecturing and discussions as the most common forms of teaching and learning techniques. Albeit their popularity, these pedagogical techniques often face a lot of criticisms from different educational research scholars leading to the development of an assumption that it does not help in a deep understanding of the concepts taught in the class (Fernández-López et al., 2013; Marino et al., 2014). Therefore, cooperative learning is among the key strategies for addressing limitations associated with the traditional pedagogical approaches. The debate about the effectiveness of cooperative learning compared to the traditional pedagogical approaches has significantly increased in recent years. For example, Okolo and Diedrich (2014) and Reed et al. (2011) reported that the traditional class activities lead to the creation of a win-win situation, in that a student can only succeed if others fail to register the set target scores; this is contrary to the case of cooperative learning which advocates for the success of all students.

However, both Okolo and Diedrich (2014) and Reed et al. (2011) failed to establish the specific group of SEN learners where cooperative learning can be applied. Cooperative learning mainly advocates collaboration and teamwork among learners in small groups, hence can be more challenging to implement among students with emotional disturbance and autism (Fernández-López et al., 2013). Even though evidence from Sermier Dessemontet and Bless (2013) could be

used to demonstrate the significance of cooperation and interaction between the SEN and non-SEN learners within a blended classroom setting, the study employed a quasi-experimental approach which does not involve the use of randomization hence limiting its ability to develop a conclusion about the causal relationship between an intervention and outcome being analyzed. Sermier Dessementet and Bless (2013) further made a general conclusion that there is no significant difference in the progress of low-, average- or high-achieving pupils from classrooms with or without inclusion. However, such general remarks can misinform the readers who rely on the information provided in the abstract section of the paper because the study further reported that there were two out of the 404 learners whose advancement was well above most of the participants.

A key finding that was registered by Reinke et al. (2011) is that 75% of the surveyed educators testified either working with or mentioning students with psychological health problems within a period of one year. Some of the key special education needs highlighted in this study include disruptive and acting out behaviors, attention problems, and hyperactivity (Reinke et al., 2011). Even though evidence from this study adds to the literature about special education, Reinke et al. (2011) only included teachers from one state who were most likely trained by the teacher education programs within the single case state. For that matter, their precepted needs may not be a true representative of the teachers from the other regions within the United States. In terms of the methodological design, an article by An and Reigeluth (2011) has a more effective one compared to Reinke et al. (2011) because of two reasons. First, Reinke et al. (2011) only included 21 classroom teachers from one state compared to 126 teachers from two states, northeast Texas and southwest Arkansas in the case of An and Reigeluth (2011). Secondly, Reinke et al. (2011) employed a qualitative design involving the collection and analysis of data using interviews and thematic analysis while An and Reigeluth (2011) used a quantitative approach, which increased

the generalizability of its generated outcomes to a wider special education teacher population. However, the qualitative approach in Reinke et al. (2011) led to the generation of more comprehensive outcomes as they included perceptions and personal opinions of the interviewed teachers as data.

Regardless of methodological design employed, all the reviewed studies established evidence showing that cooperative learning is an important tool for ensuring the inclusion of SEN learners into mainstream classroom settings. All models of cooperative learning incorporate cognitive, social, and attitudinal learning outcomes to the quality and quantity of cooperative interactions that take place among group members. Concurrently, Bauminger-Zviely et al. (2013) and Fernández-López et al. (2013) considered participation in group work (a key principle of cooperative learning) as an important technique for supporting the learning process among SEN students within the blended classroom settings. Ciullo et al. (2015) reported remarkable rates of group work participation as 45% of the respondents stated that all the special education learners consistently participated in cooperative learning and that without such a pedagogical approach, lower rates of participation among SEN learners could have been registered.

#### ***4.2.4 Gamification***

Gamification is a new approach to learning focused on motivating students to acquire knowledge through video game design and game elements (Bauminger-Zviely et al., 2013). The primary goal of this approach is to enhance enjoyment and increase involvement by catching the interest of children as well as motivating them to continue learning. The reviewed studies noted that many researchers have endeavored to coherent the role of technology within the Universal Design for Learning (UDL) curricular materials over the past decades. Marino et al. (2014) stated that educators, scholars, and funding agencies often dedicate a continually cumulative amount of

time and resources in order to enhance access to science education materials through the application of technology.

Through the UDL approach, teachers are able to develop teaching programs that help give all learners equal opportunities to succeed. Gamification is often incorporated into learner-centered classrooms and the development of personalized and customized learning practices in order to meet the needs of SEN learners. According to An and Reigeluth (2011), learner-centered teachers do have high expectations from all the learners (both SEN and non-SEN) and pay much attention to the knowledge, skills, and attitudes which every student brings into the classroom. Based on the unique and diverse needs of the SEN learners, personalized and customized learning strategies developed using the gamification approach include personally meaningful and appropriate goals as well as enhance the provision of a tailored learning experience and support. Compared to other games developed for non-entertainment purposes, gamification involves the application of game design elements within the non-game context, with the most commonly applied aspect of gamification being the use of an achievement system.

A significant number of the reviewed studies, such as Bauminger-Zviely et al. (2013), Ciullo et al. (2015), and Okolo and Diedrich (2014), argued that despite the ability of gamification to promote transient forms of motivation, its effects are largely dependent upon the context where it is being applied. For example, Bauminger-Zviely et al. (2013) noted that people using the gamified tools to achieve physical fitness are voluntarily using the program compared to the SEN learners who are compelled to utilize a gamified platform to learn technical subjects such as science, technology, engineering, and mathematics (STEM) subjects. Therefore, there is still an unresolved problem on whether the use of gamification programs can motivate SEN learners to achieve their academic and social goals even if they are compelled to use it. The impacts of

motivations on student performance have been extensively researched and reported in many studies (Okolo & Diedrich 2014; Sermier Dessemontet & Bless, 2013; Reinke et al., 2011).

A study by Reed et al. (2011) focused on assessing and reporting the impacts of gamification (and other technology-based learning activities) to motivate autistic learners who are at a critical point in their education revealed incorporating gamification into special education pedagogical practices motivated students to commit themselves to learning activities and increase their performance. The findings from this study, therefore, stress how gamification strategies are assumed by teachers as important as how they are structured with reference to the educational outcomes. Albeit the availability of evidence supporting such relationship as reported by Bauminger-Zviely et al. (2013) and Reinke et al. (2011), it is important to note that the empirical data that supports educational benefits of gamification in relation to increasing student motivation or associating motivation to learning outcomes is still in early stages of development

Evidence presented by Reed et al. (2011) dictates the establishment of best practices about the application of gamification, despite the study having some important limitations. For example, Reed et al. (2011) only included students with autism in the study and all of them were treated with a gamification program; hence failed to comparatively assessed the impacts of gamification as a pedagogical tool for special education among autistic and non-autistic children. With regard to the exploration conducted by Okolo and Diedrich (2014) to assess how video-supported learning and use of games can be applied among students with intellectual disabilities, it was argued that the potential benefits of this approach can be applied beyond this SEN population who might be experiencing different challenges than those diagnosed with intellectual disabilities.

The qualitative and quantitative approaches employed by Marino et al. (2014) produced contradicting outcomes regarding the efficiency of video-based learning and gamification

programs on academic success among SEN learners. Specifically, the qualitative data supported the belief that the UDL units presented no valuable impacts to the students with learning disabilities. On the other hand, posttest scores from the game-supported pedagogical approaches showed a significant improvement compared to the pretest scores, with more academic improvements being registered within only traditional instruction. However, the approach employed by Marino et al. (2014) coincides with guidelines set by most of the school districts. Game-based learning has not been successfully implemented because of its perceived implications, both positive and negative. For example, Bauminger-Zviely et al. (2013) and Sermier Dessemontet and Bless (2013) mentioned factors such as inconsistent empirical evidence, limited resources among most of the public schools, time constraints, methodological flaws in empirical studies on games, the stigma associated with video games in learning and limited evidence-based best practices required for successful incorporation of games into the mainstream classroom setting, as key limiters of its successful implementation. In order to register more appealing outcomes from the game-based learning, educators need to personalize games based on the needs of SEN learners targeted.

#### ***4.2.5 Problem-Based Learning***

Teachers are always encouraged to employ different types of pedagogical approaches so as to foster knowledge, skills, and dispositions that the teacher's perspective should be successful in a diverse classroom setting (Haydon et al., 2012). Even though most of the available pedagogical approaches focus on direct instruction, there are other strategies that can be used to ensure more effective engagement of learners and promoting the application of knowledge acquired during classroom practices. Compared to the other forms of more didactic instructional pedagogical approaches, the use of problem-based learning often requires students to pose their questions,

explore answers to the posed problems through reading and research, share their perspective about the correct answer with their colleagues and then develop a final presentation to the group members about the problem resolution (Haydon et al., 2012). The engagement process within problem-based learning primarily involves synthesis and construction of knowledge so as to resolve the assigned problem. Even though Sermier Dessemontet and Bless (2013) initially claimed that problem-based learning participation can improve the knowledge base and perceptions of the preservice teachers regarding working with SEN learners within an inclusive learning environment, the outcomes from their analysis showed that there are other important factors that could have contributed to the development of such changes. Corresponding arguments were provided by Reinke et al. (2011) who noted that although problem-based learning has been considered as an important tool for enhancing motivation and involving potential teachers in problem-solving, learning, collaboration, critical thinking, and decision-making process, the study failed to directly explore the impacts of all these factors.

In a study by Okolo and Diedrich (2014) which included 1143 Michigan special education teachers as participants, it was noted that most of the preservice teachers taking part in the PBL unit often start to perceive the significance of inclusion teacher as a team member and that most of the participants expressed increased participation among learners following the implementation of this strategy. Corresponding outcomes were also reported by Fernández-López et al. (2013) who claimed that through problem-based learning, SEN learners within the mainstream schools register the improved quality of academic success compared to their colleagues within the special education schools. However, Fernández-López et al. (2013) failed to specify the types of educational needs that the included students were experiencing; this limited efficiency and generalizability of generated outcomes because different SEN learners often have varying needs.

For example, problem-based learning might be very challenging to implement among students with communication and social problems such as autism because such skills are required during their group discussions and problem-solving process.

In a study by Ciullo et al. (2015) focused on assessing and reporting the most effective approaches for teaching social studies to upper elementary students with special educational needs, it was revealed that incorporation of clear instruction, graphic organizers, and daily social studies text reading helped in the realization of more effective learning outcomes. The study also reported treatment effects on each student and that the experimental controls were established; for example, positive alterations took place on the dependent variables only when the treatment was applied within all participants (Ciullo et al., 2015). The results in this study show exhibition of a purposeful association among all the students on daily content puzzles and negligible performance intersection between the conditions. Correspondingly, outcomes from this study agree with those presented in Haydon et al. (2012) as both developed a conclusion that inclusion of SEN learners into the mainstream classroom environment helps in improving their academic performance because of the increased engagement and interaction with the non-SEN learners.

Even though the time taken to conduct the study by Ciullo et al. (2015) is relatively longer than quite a lot of graphic organizer literature about students with SEN (such as (Haydon et al., 2012; Reed et al., 2011; Reinke et al., 2011), it did not include treatment with additional sessions and weeks which might have provided other beneficial information about the efficiency of problem-based learning approach in special education. Furthermore, Ciullo et al. (2015) employed researcher-developed measures for acquiring social studies contents, similar to some of the content-area text and graphic organizer literature such as (Reed et al., 2011; Reinke et al., 2011). A probable limitation associated with this measure is that Ciullo et al. (2015) were not able to

methodically assess the relative correspondence of puzzles with complete certainty. Nonetheless, the limitation was moderated in the study following the application of co-variance of dependent and independent variables as well as multiple replications at different points in time among the respondents. Driven by the 21<sup>st</sup>-century learning principles and championed by information and communication technology promoters, the project-based learning rests upon important philosophical foundations as supported by previous evidence from different studies, such as Reed et al. (2011); Reinke et al. (2011), and Sermier Dessemontet and Bless (2013). Therefore, SEN students (such as those with communication and social skill challenges) might not successfully interact and collaborate with other group members if the project-based learning process is not properly moderated by teachers.

#### ***4.2.6 Design Thinking Approach***

According to Sermier Dessemontet and Bless (2013), the three essentially inter-related factors that the special education teachers should acknowledge when offering teaching services to the SEN learners include the approach, its appropriateness, and its applicability. The success of teaching approach employed by the special education teachers or mainstream teachers to enable SEN learners to achieve their academic and social goals within the blended learning environment includes the involvement of transdisciplinary collaborations among the special education teachers and other educational stakeholders, application of multisensory strategies, and incorporation of UDL. As recommended by the IDEA, all the students with SEN should be provided with additional support services, specialized placements, customized programs as well as least restrictive environments in order to cater for the learning and behavioral needs (Okolo & Diedrich, 2014). For special education teachers to be successful in the modern dynamic and competitive academic world, they need to design and use varying forms of skills compared to those required prior to the

identification of SEN learners. Albeit the mainstream school teachers often have the opportunities to attend in-service training programs with the intention of equipping themselves with the most appropriate pedagogical knowledge and skills, increased attention has also been provided to the special education teachers in the present days than before, so as to provide them with relevant skills and experiences needed for teaching SEN learners. Among the key strategies for equipping special education teachers to fulfill their professional goals is the design thinking approach.

An and Reigeluth (2011) made important contributions to the existing evidence about design thinking in special education, analyzed data was gathered from 126 teachers and that their generalizability was not reported. Fortunately, the participating teachers provided important insights into how to support special education teachers during designing and redesigning technology-enhanced and learner-centered classrooms. Contrary to An and Reigeluth (2011) which designed a learning environment for SEN students in general, Bauminger-Zviely et al. (2013) employed a design thinking approach to develop collaborative technologies for increasing engagement among children with autism. Despite the findings being applicable to only autistic children, Bauminger-Zviely et al. (2013) reported an improved socio-cognitive among children with autism following the implementation of collaborative technologies within the school environment. Nonetheless, Bauminger-Zviely et al. (2013) did not include non-autistic children in their study hence the findings could not be used for understanding possible impacts of incorporation of designed collaborative technologies in improving engagement and performance among students with different educational needs.

The change from knowledge to competency-based education has forced most educators to shift their way of thinking and working. As reported by Haydon et al. (2012), the traditional knowledge-based curriculum was not very demanding with reference to the instructional design in

the form of learning tasks. The learning materials were mainly composed of piecemeal practices characterized by isolated knowledge and skills which make up the entire task. On the contrary, a new curriculum developed using the design thinking approach requires teachers to think holistically in relation to the entire authentic tasks which the competent professionals are expected to execute (Okolo & Diedrich, 2014). With regard to the evidence about the instructional design theories provided by Reed et al. (2011) and Sermier Dessemontet and Bless (2013), the learning process should be made up of meaningful whole task experiences that are integrated with relevant knowledge and skills.

From a cognitive load theory perspective, two factors can be considered in order to increase the probability of transforming the ideas in the design thinking approach by teachers into a concrete pedagogical process (Marino et al., 2014). First, the cognitive load theory believes that the success of an instructional design developed using the design thinking approach often depends on the level of cognitive support provided by instructional design methods (Marino et al., 2014). The second perspective is anchored within the collaborative design of the approach. According to Marino et al. (2014), an integrative and holistic approach of thinking which is needed for developing and implementing a design thinking approach within special education requires teachers and other educators to assess and redesign all the teaching tools utilized for teaching knowledge-based curriculum. In education practice, encouraging collaborative work among teachers can help in designing and implementing more effective pedagogical approaches for SEN learners. With reference to cognitive load, interdisciplinary collaboration for design thinking approach leads to the increased availability of cognitive capacity, but consequently lower the cognitive load.

#### ***4.2.7 Thinking-Based Learning***

The thinking-based learning method identifies emerging pedagogical principles that have been found to promote teaching specific practices and techniques and thinking in general (Haydon et al., 2012). The U.S teachers have been exposed to various instructional methods in the past 25 years that have enabled them to improve or unleash students' practices and abilities. There is evidence supporting the kind of thinking strategy or outlining a possible plan for thinking, thinking to be exercised, and discussing the prevailing drawbacks in thinking, leading to a better outcome than just soaking learners in open-ended challenges that require in-depth review to solve or avoid (Bauminger-Zviely et al., 2013; Sermier Dessemontet & Bless, 2013). In a comprehensive correlational analysis, An and Reigeluth (2011) compiled various studies based on critical thinking in curriculum arrangements: an immersion approach, where no explicit mention was made of specific strategies, and inquiries, vignettes, and case studies were the methods used to provoke the learner's thinking.

Applying the methodology of design and development research is justified by validating the practical ability and pragmatism in testing the theory. Thinking-based learning is described by Reinke et al. (2011) as the way to establish new tools, techniques, and procedures based on a definite needs analysis that developed a unique teaching module. Based on Reed et al. (2011), there are five essential phases in developing modules: the design development, evaluation phase, execution phase, and the analysis phase. Being the foundation of all steps, the analysis phase involves identifying the module target teaching context, assignments, and course content, identifying the problem's course, and coming up with the solution (Reed et al., 2011). Document analysis is carried out on the Assessment Standard Document and Curriculum in the Algebra and Relationship learning area to identify the thinking-based learning method's suitability. Through

the thinking-based learning module, learners are familiarized with developing teaching aids, training, assignments, course content, and lesson plans. Mathematics educational experts approve the completed thinking-based module.

According to Fernández-López et al. (2013), the learning and teaching activities using the thinking-based learning module are initiated to test the reliability and feasibility of the module being developed. Completing the two phases should indicate that the developed thinking-based module is ready to be implemented and followed. The sample to determine the reliability and the model to validate the module is done by randomly selecting the mathematics teacher who participated in the phase. Okolo and Diedrich (2014) stated that the most suitable strategy for implementing thinking-based learning to the SEN students is the thinking disposition approach.

In agreement with the outcomes from the study by Ciullo et al. (2015) which involved the scrutiny of learners' mathematical capabilities with reference to their mathematics self-concept, teaching mathematics' objectives include formal goals that reiterate shaping, reasoning, and organizing student's personality; and applying mathematics to emphasize problem-solving skills. The research suggests that the mathematics learned in the classroom should imitate the learner because the mathematical problem drives them to include convincing, verifying, explaining, conjecturing, justifying, generalizing, altering, reversing, varying, changing, organizing, sorting, comparing, correcting, deleting, completing, specializing, and exemplifying. According to Reinke et al. (2011), those activities are the activities that build the learner's mathematical thinking skills to achieve the objective of mathematics in school. The ability of the SEN learners to accomplish their assigned projects has constructive and important interrelation with their intellectual development and self-concept. The study aims to explain students' mathematical thinking skills based on the mathematics self-concept in senior high school. In other words, this research was

meant to reveal the student's mathematics thinking based on what they already know or have in mind. Furthermore, the study compares two analogies, whether there is a variation in mathematical thinking between the learners with negative or no mathematics self-concept and the learners with positive mathematics self-concept, and the impact of mathematics on mathematical thinking skills.

There are specific things that teachers need to do in order to support children with SEN. For instance, ensure that the teacher is organized and understand the different types of challenges in every child in a classroom. It is also essential to always give them time to participate in a contest and organize more group work activities to interact (Bauminger-Zviely et al., 2013). Successful execution of special education teacher roles helps in increasing the thinking abilities of the SEN learners as well as to register high scores in their academic work. Furthermore, (Marino et al., 2014; Sermier Dessemontet & Bless, 2013; Reinke et al., 2011) reported that most students with SEN who drop out of school in the United States go for further studies in the United Kingdom but do not progress well and end up dropping out without qualifying. Although adjustment such as having large prints, considering furniture placement, and adjusting the light in the classroom is crucial to enable easier access to the curriculum, Heydon et al. (2012) noted that teacher educating learners with visual impairment should ensure that the learners equipped to access resources independently. The researcher reports that student can do better if given student-centered support: the learner is given whatever tool they need depending on their disability to help them communicate or go through their learning process effectively, and be given structured support for both emotional and educational development.

#### ***4.2.8 Competency-Based Learning***

SEN learners often learn at a relatively low pace compared to the non-SEN colleagues. Therefore, it is important to develop a personalized approach that would enable them to achieve

high scores in education despite learning at a slow pace (Reinke et al., 2011). For instance, many states are eliminating Carnegie, seat time, or credit units as requirements for graduation and replacing them with policies that require students to demonstrate their understanding of defined competencies (Fernández-López et al., 2013). Other than the standard credit requirements and High school diplomas will have an ordinary meaning across the district if there are clearly articulated competencies or standards that learners must master to graduate.

Reed et al. (2011) and Okolo and Diedrich (2014) argue that a transparent system focused on learning is expected to improve students' readiness for postsecondary success and increase high school completion rates. Outcomes from Okolo and Diedrich (2014) can be used by the states in the region to know the terms used across the region and better understand as they move forward with their competency-based learning implementation and initiatives. The findings provide insights for districts and states to inform policy on professional development and needed resources to support competency-based learning implementation. According to Reed et al. (2011), the study found that the ability to adapt the pedagogical content of an archetypal school curriculum without unique needs but to the level of cognitive functioning of individual learners is fundamental for inclusive education teachers. The finding differs from the general pedagogy, which is ingrained in quality education for all learners in the typical classroom community, whether they are students with SEN or not. Deliberation of intellectual expansion enforced by teachers in their management of inclusive learning and development is essential in adapting school curriculum to children with SEN and without disabilities (An & Reigeluth, 2011). However, these findings contract the principle of inclusive pedagogy, which requires a change in learning and teaching from an approach that works for most children.

With reference to Marino et al. (2014) and Okolo and Diedrich (2014), competency-based learning philosophy is developed using the assumption that learning is made available for all learners to participate in typical classroom life. Furthermore, other research found that inclusive learning involves improved erudition among all students in the community of the typical classrooms, even when they are children with SEN (Ciullo et al., 2015). Furthermore, Ciullo et al. (2015) that teacher capability in modifying and adapting assessments to children's unique needs with SEN for inclusive education. Inclusive education necessitates the competency of teachers appraising children with SEN in the society of their typically developing peers in standard classrooms reported by Sermier Dessemontet and Bless (2013). Equivalently, inclusive pedagogics requires teachers to respect the SEN learners irrespective of their differences, instead of excluding them from what is generally available in the typical school curriculum. Teachers' competency is adapting teaching techniques, strategies, and methods to the individual to children in their differences to be indispensable for inclusive education. Similarly, teachers need knowledge at different levels, such as individualized instruction to facilitate learning, activity-based learning, and multilevel instruction to facilitate SEN children learning in a typical classroom.

Setting aside time for teacher collaboration is critical (Bauminger-Zviely et al., 2013). The study further found that aligning curriculum and developing competencies, grading, assessment, and instruction practices to the competencies require setting aside time during the school day and establishing a professional culture of sharing practices for teachers to participate and collaborate in focused discussions on shared expectations. According to the findings, leadership teams that included teachers were essential for supporting the reform among staff and establishing understanding. Guidance, research, and more examples are needed to support schools' implementation (Reinke et al., 2011; Reed et al., 2011). Many states, school administrators, and

district noted they used examples and research from other institutions that had implemented competency-based learning to execute their implementation. Therefore, more examples and models are needed to help staff approach their circumstances, so they understand the most. They also reported that many people mistake competency-based learning and assume that it should be automatically implemented in their setting.

Administrators and schools with SEN children had considered adopting competency-based learning but have not adopted it because of the challenges and barriers to the reform (An & Reigeluth, 2011). Therefore, this study relied on the interview data from a purposive and limited convenience sample. Across theoretical and empirical reports on competency-based learning dwell on various recommendations were highlighted as essential for the reform's success. A standard recommendation was establishing a broad base of support through noticeable communication (Sermier Dessemontet & Bless, 2013). Communicating and developing a consistent message to parents, students, teachers, and administrators are well informed that competency-based learning is accepted in college success and admission standards were discussed and dedicating resources to communicate and measure the stakeholders. Alternatively, policies are needed to ensure all communications with students, community members, and parents are executed so that they understand the advantages of competency-based education as reported by theoretical research (Reinke et al., 2011). The National Governors Association had a recommendation that recommended the states' involvement in building support to local districts and make them understand that students must demonstrate what they learn to earn credit.

State departments of education documents in Oregon, conversely, state that competency-based learning is not limited to optional ways to award credit but a student's instruction that is standard cased with explicit learning outcomes against which the learners are evaluated on their

performance (An & Reigeluth, 2011). Learners are allowed multiple opportunities to indicate that they understood what they were taught, and teachers collaborate with colleagues and use assessment throughout instruction to improve practice. Competency-based learning on immediate employer needs and shallowly preparing learners with the flexibility required for a more uncertain future (Bauminger-Zviely et al., 2013). Furthermore, it does not suit subject areas where new knowledge and new skills need to be rapidly accommodated or challenging to prescribe specific competence, ignoring social learning's importance.

### **4.3 Discussions**

According to NCES (2020), there were approximately 98500 public schools in the United States, made up of around 91300 traditional public schools and 7200 public charter schools in the school year 2017-18. Despite an increase in the number of schools compared to the school year 1999–2000 which was 90500 for traditional public schools, 92000 for public schools and 1500 for public charter schools, demand for schools (especially special education schools) is still high (NCES, 2020). Therefore, a blended learning system is recommended in order to include the SEN learners in the mainstream schools. The flipped classroom is a form of an integrated learning method where learners are familiarized with contents at home and practice working through it at school (US Department of Education, 2019). Therefore, this is the opposite of the more common practices used for introducing new content at school, then assigning the learners homework and projects to be independently completed.

Correspondingly, Sermier Dessemontet and Bless (2013) and OSEP (2019) noted that flipped learning model involves the use of pre-recorded guide about the lesson and then proceeds on to the completion of the assignment. Precisely, the pre-recorded instructions are delivered to the students through online modality in order to help them grab concepts in a relatively relaxed

manner, which is often varying in each learner. However, NICHCY (2019) criticized the efficiency of pedagogical strategies that fully rely on online mechanisms as some of the SEN learners often come from deprived regions hence not able to afford the required technological resources for supporting their learning process. As an approach for addressing the criticisms by NICHCY (2019), Okolo and Diedrich (2014) noted that the flipped learning caters for face-to-face interactions by supporting differently-abled learners within a blended classroom setting and enable them to perform interactive activities. Therefore, flipped classroom approach does not only help in ensuring the inclusion of SEN learners into the mainstream school setting but also allowing for their easy transformation from one level of education to the other. Furthermore, the generated outcomes contradict verdicts by Okolo and Diedrich (2014) and the US Department of Education (2017) that SEN learners within a blended classroom setting often perform poorly compared to the non-SEN learners as most of the mainstream classroom settings do not have the required resources to support the educational needs of SEN students.

In order to register improved academic performance, Reed et al. (2011) advised the special education teachers and mainstream teachers to use simple and concrete language, provide the learners with limited and clear choices, be gentle in criticism and apply discrete trial teaching (DTT) and applied behavior analysis (ABA) whenever possible. Through the ABA approach, special education specialists are able to assess and evaluate specific behaviors of SEN learners, such as social skills, communication, and adaptive learning skills, and apply interventions to help in altering negative behaviors (NCES, 2020). However, Ciullo et al. (2015) noted that the ABA approach can be more effective in cases where therapy is started while the child is still young (less than 5 years). According to the NCD (2019), more significant outcomes can only be achieved from a blended learning system if all the stakeholders in the education system are included in the

formulation and implementation of new pedagogical strategies. With flipped learning approach, parents of SEN learners are often actively involved in the learning process of their children as they are required to help them understand the contents of pre-recorded videos. Consistent with Reed et al. (2011), most of the teachers always prefer using video or Digital Video Disc (DVD) when teaching autistic children. In this approach, the learners are provided with the pre-recorded classwork and allocated adequate time in order to understand their contents.

The growing appeal for technology-supported student-centered pedagogical approaches has been influenced by different factors. For example, the US Department of Education (2019) noted that project-based learning has the ability to ensure student motivation, conceptual knowledge, and acquisition of problem-solving skills. Regardless of increased reforms within the US education sector, poor postsecondary outcomes for the high school graduates (especially those with SEN and disabilities) is still a major problem. Congruently, Reinke et al. (2011) reported that a large percentage of learners with special educational needs and disabilities who progress from high school and enroll in college often fail to pass English or language arts and mathematics placement tests hence enrolling for remedial classes prior to being acknowledged as college-ready students. Such problems have influenced the occurrence of low postsecondary completion rates for academically underprepared and low-income students. Therefore, the project-based learning pedagogical approach has been highly recommended by most educators because of its ability to enable SEN learners and those with disabilities to realize their academic potentials. Consistent with NCES (2020), at least 17% of the total US public school population in the school year 2015-16 was made up of SEN learners and youths receiving special education services. Within the same year, 61% of the SEN learners under the IDEA program who were enrolled in regular public schools spent a significant percentage of their school days in general classrooms.

Sermier Dessemontet and Bless (2013) reported evidence on the impacts of inclusion-related variables (such as class size, years of experience, teachers' special education training, the occurrence of a compensated assistant in the schoolroom, and meeting frequency between special education teacher and classroom teacher) and academic performance among the SEN learners. The results from this study revealed that control of these background variables appeared to have no substantial variation in reading achievements among SEN students within or out of a blended classroom setting (Sermier Dessemontet & Bless, 2013). The outcomes from Sermier Dessemontet and Bless (2013) agree with the sentiments provided in NICHCY. (2018) and the US Department of Education. (2016) where it was noted that the quality of special education is often influenced by different factors such as the size of the class, competency level of the special education teachers, and availability of personalized pedagogical strategies targeting the involved SEN students. correspondingly, NICHCY. (2018) noted that the special education teachers' experience and competency level often depend on the number of years they have been in service.

Reinke et al. (2011) and Reed et al. (2011) reported one contrary observation to this general conclusion by stating that non-SEN learners from classrooms with SEN students (such as those with autism) with no support of a paid aide registered low performance in reading compared to their colleagues from non-inclusion general education settings. Nonetheless, NCES (2020) and OSERS (2020) reported that inclusive education has positive impacts on the academic performance of all learners (both SEN and non-SEN) as it provides children with the opportunity to work on their individual goals as well as encourage the involvement of parents in the education of their children. Even though the reviewed studies in this paper have provided relevant evidence regarding the social skills intervention procedures for SEN learners such as autistic children, such evidence is either descriptive in nature (Okolo & Diedrich, 2014; Sermier Dessemontet & Bless,

2013) or fails to focus on the technological applications necessary for the implementation of project-based learning models for SEN learners (Reinke et al., 2011; Reed et al., 2011). With the exemption of Reed et al. (2011), all of the aforementioned studies did not overtly need methodologically rigorous inquiries in order to establish their evidence about the efficiency of new pedagogical approaches on the inclusion of SEN learners in mainstream classrooms settings.

Evidence from the reviewed studies agrees with those from the official documentation about special education in the United States, such as NICHCY (2019), OSERS (2020), and the US Department of Education (2016). Even though Ciullo et al. (2015) generally stated that cooperative learning through group discussions helped learners with intellectual disabilities to achieve higher academic scores, there were also findings that only less than 50% of the participating SEN children registered academic success and that their groupmates were not willing to make effective accommodations for them. For that matter, cooperative learning might further expose the SEN learners to harsh learning environments if the teachers fail to effectively moderate activities taking place in the assigned study groups. In line with the definition by the US Department of Education (2019), cooperative learning refers to the teaching method which involves students in the learning process so as to understand and comprehend the contents of the subjects.

Outcomes from Sermier Dessemontet and Bless (2013) agree with those from Bauminger-Zviely et al. (2013) which reported that the progress of students without special needs and disabilities are not negatively impacted following the inclusion of SEN learners in their classroom with 4.5 to 6.5 hours of support from special education teacher per week regardless of their academic achievement levels. Therefore, the evidence presented in Bauminger-Zviely et al. (2013) and Sermier Dessemontet and Bless (2013) contradicts the opinion of OSEP (2019) that the inclusion of SEN learners in a mainstream classroom setting can lower the performance of non-

SEN learners if they the teachers in charge fail to successfully moderate learning process. Inclusive education helps in fostering the culture of respect and belonging among every stakeholder within the education sector, and its efficiency can be improved through the implementation of UDL strategies (NICHCY, 2018; OSERS, 2020). Designing schools and classes so as to meet the needs of children is still an important challenge faced by most schools in the country. Nevertheless, this goal can be achieved through the application of design thinking approach (US Department of Education, 2016). Learning schools and classrooms must be developed to support the learning process for both SEN and non-SEN students.

Marino et al. (2014) stated that the UDL curricular has the ability to provide teachers with the chance to effectively assimilate intellectual pedagogics with technology in order to access specific content. NDA (2018) supported the arguments of Marino et al. (2014) by stating that computer technology plays an imperative role in most of the 21<sup>st</sup>-century educational activities outside of the school environments despite being optional for enabling students to realize high standards within the school. Nonetheless, An and Reigeluth (2011) claimed that the goals of UDL can still be realized without the incorporation of the technology; hence an important way of maintaining the status quo.

The US Department of Education (2017) has highlighted various approaches through which motivation can impact academic performance among SEN learners: directing personal behaviors towards specific goals, putting more effort and energy into activities associated with such goals. Consistently, the evidence presented by OSERS (2020) shows that teachers and other educational practitioners should not only depend on intrinsic motivation as a reward mechanism while most of the learning activities are not inherently enjoyable and interesting. Similarly, Ciullo et al. (2015) and NDA (2018) argued that even though extrinsic motivation has been considered

to be an important form of motivation, learners can still undertake extrinsically motivated action with resistance, resentment, and disinterest or with an attitude of willingness reflecting an inner acceptance of the utility and value of the task. The increasing application of gamification within the special education context has been influenced by the available relationship between learning and motivation. Adding to the debate, OSEP (2019) and the US Department of Education (2017) noted learners who engage in open-ended exploration first outperformed their colleagues who used the traditional textbook materials, hence a suggestion that both video-supported teaching and textbooks should be implemented after the exploration in order to ensure the realization of more positive outcomes.

Nonetheless, Ciullo et al. (2015) mainly included learners with linguistic and meta-cognitive weaknesses which is an indication that such outcomes could not be generalized on students with concentration challenges such as Attention deficit hyperactivity disorder (ADHD), students with social and communication skills such as autistic learners and those with intense phobia including anxiety disorders. Fortunately, this limitation of Ciullo et al. (2015) was in some way addressed by the arguments in the US Department of Education (2019) which noted that all SEN learners often require personalized support and that the researchers and practitioners to design pedagogically sound strategies through iterative reflections. Correspondingly, evidence from OSERS (2020) and the US Department of Education (2019) supported the use of technology-driven pedagogical approaches as they allow for the provision of students with badges necessary for overcoming personally evocative challenges, allow them to identify personal weaknesses through improved interaction with special education teachers as well as allowing the learners to achieve self-reflection and monitoring of their academic improvements. Therefore, studies by Reinke et al. (2011) and Sermier Dessemontet and Bless (2013), form background for future

research to explore whether the gamification can be considered as an important tool for learning among all SEN students and specific aspects that should be considered when designing gamification programs for SEN learners in a blended classroom setting. Marino et al. (2014) included a mean intercession pedagogical time of 800 minutes, with around 100 minutes playing time for video games hence philosophical to around 14 days teaching space teaching period, which is relatively less than the 9-12 weeks recommended by the US Department of Education (2016) during interventional research for special education.

Among the modern pedagogical approach for ensuring improved quality of education within special education is problem-based learning which the US Department of Education (2019) defined as a tool for organizing portions of curriculum about ill-structured complications found within the educational setting. Similar to the case of instructional approaches such as project-based learning, simulations, discovery learning, and case methods, the problem-based learning identifies problem which needs to be addressed, allows for active participation of key educational stakeholders, can be performed in either small or large groups and promotes discussions among learners moderated by the teachers. Similar to other modern pedagogical approaches in special education such as flipped classroom, cooperative learning, and thinking-based learning, project-based learning has also been criticized regarding its ability to ensure quality education among SEN learners, especially when they are incorporated into the mainstream classroom settings. For example, evidence from the US Department of Education (2017) shows that frequent criticism of project-based learning has been associated with the ability to limit cooperation and teamwork among all the group members, as some of the learners might decide to sit back and let others complete their assigned group tasks. As an approach for addressing this limitation, the US Department of Education (2019) recommended that both the special education and mainstream

teachers should build into the structure of project-based learning curriculum and organizational strategy called Jigsaw and Expert Groups which would help all students to be self-directed, independent and work towards the realization of the set group goals.

As stated by the US Department of Education (2019), implementation of project-based learning has been widely attempted by most of the U.S school districts but proved to be an unmitigated disaster, particularly among the high school teachers and students. The adopted project-based learning approach used a top-down approach leading to its fierce resistance from parents, teachers among other educational stakeholders who openly opposed the new curriculum on the grounds that its focuses on teaching thinking skills with no subject contents. NDA (2018) noted that the project-based learning movement in the US and North America, in general, has been influenced by progressive educational principles as well as an irrefutable passion for engaging all students during the learning process. According to the US Department of Education (2016), a project-based learning approach enhances engagement among learners as projects offer learners the chance to actively take part in the group works because of the continued interactions between SEN and non-SEN students. However, Sermier Dessemontet and Bless (2013) refuted such claims by stating that project-based learning might not influence engagement among all learners as part of the learning process within this strategy is a desire not to let other group members down.

According to the US Department of Education (2017), design thinking is an investigative and imaginative approach that engrosses a person with prospects to experiment, develop, and archetype models, collect feedbacks and redesign. Therefore, special education teachers can use the design thinking approach to address work-related challenges which include scope and scale of curriculum, physical space as well as the resources needed for addressing the needs of SEN learners. The research study by An and Reigeluth (2011) might also be placed in the context of the

design thinking approach as it was focused on developing a technology-enhanced, learner-centered classroom that involves redesigning the traditional classrooms and learning resources to meet the needs of SEN students. An and Reigeluth (2011) established that most of the technology incorporation training emphasizes technical knowledge and skills while overseeing the dynamic associations between technology, instruction, and curriculum content. Even though the teachers learn about new pedagogical approaches, they are still faced with a lot of challenges in implementing them within the learning environments (An & Reigeluth, 2011). For that matter, findings from An and Reigeluth (2011) coincide with the arguments in US Department of Education (2017) which state that successful technology integration often requires more than technical skills and that such integration should enable teachers must develop technological, pedagogical, and content knowledge (TPACK) through the provision of subject-specific technology incorporation concepts as well as opportunities for exploring technologies within the authentic teaching and learning contexts.

An obvious but imperative consideration during the designing of classrooms for SEN learners is accessibility, specifically if space is planned as a flexible or multi-use space (NCD, 2019). The classrooms should be designed so as to address the needs of SEN learners and allow for easy navigation among students with disabilities. So as to be truly innovative and revolutionary, teachers and other educational stakeholders should undergo design thinking training (Reinke et al., 2011). In order to design learning tasks that meet such requirements and incorporate them into the education practice, teachers and other educators must be able to analyze the strategies and principles that are utilized by experts in solving the typical types of problems within a specific domain. Similarly, teachers have the responsibility of creating a series of problem situations, that need students (both SEN and non-SEN) to apply the identified principles and strategies to increase

their academic competence and enhance performance. Compared to another contemporary pedagogical approach such as gamification, flipped classrooms, project-based learning, and cooperative learning which put more attention on the students, the design thinking approach primary determined to increase competency level among both special education and mainstream teachers so that they can design and redesign strategies for enhancing inclusion of SEN learners into blended classrooms and increasing performance of students with SEN (Haydon et al., 2012; Okolo & Diedrich, 2014). Therefore, the design thinking approach requires teachers to comprehend their complex domain as a single unified system.

Even though NCES (2020) and the US Department of Education (2019) explained the significance of designing, planning, and organizing lessons by teachers on SEN students' performance, none of the selected studies for review elaborated on whether teachers apply instructional design methodology when designing learning tasks for competency-based education. Inappropriately, the available evidence about teacher thinking originated from education as a knowledge transmission paradigm and cannot be successfully applied to the approach for developing authentic, whole learning strategies for competency development among SEN learners.

Examples of the latter are providing awaiting time for learner response, using higher-order questions, teaching for metacognition, and cooperative learning (US Department of Education, 2019). In contrast, others have been based and promoted their use in a typical classroom. In order to infuse these techniques into explicit content instruction, systematic frameworks for teaching thinking such as transplantation, combination, refinement, and extraction processes have to be put in place for the learners to engage with using the techniques in organized programs of instruction, making curricular the subject matter (Okolo & Diedrich, 2014). Thinking-based learning has worked in science programs and history programs but has progressively been a phenomenon in

every level of education, including college. Thinking is included in the usual curriculum in a way that understanding a topic can happen simultaneously (OSEP, 2019). Infusion is suitable for SEN students because it has a strategy that identifies common thinking patterns and gives them a deeper meaning of their learning. However, Sermier Dessemontet and Bless (2013) reported that this approach's main limitation is taking a long time to change the pattern. In order to achieve the goal of validating thinking skills in all aspects of a student's academic life, significant changes in the teaching methods and the existing curriculum was to be observed.

Correspondingly, Marino et al. (2014) and US Department of Education (2019) noted that through the use of a mixed approach, where infusion was preceded by the general policy, utilization of infusion approach with explicit emphasis and content objectives on critical thinking; and as an available course with detailed essential purposes of review. As assessed by post-test measures on a straightforward approach and immersed approach, direct systems had a more positive impact on critical thinking (Reinke et al., 2011; NCD, 2019). The limitations of the meta-analytical approach to previous studies show that they have a growing consensus on making the thinking more explicit and capture general trends. Similar to the notions by Reed et al. (2011); Bauminger-Zviely et al. (2013) and the US Department of Education (2016) also acknowledged thinking-based learning as an important for designing a teaching module is based on four essential elements: assessments, methods, objectives, and students. Specific to Marino et al. (2014), thinking-based learning helps in resolving key challenges experienced by SEN learners in both special schools and mainstream schools.

According to the US Department of Education (2016), competency-based learning refers to the pedagogical approach, assessment, grading, and academic reporting which allows students to demonstrate what they have learned, skilled they are expected to learn during their process

through education. Compared to the traditional pedagogical approaches, competency-based learning allows all students to demonstrate their level of competency for all the specified learning goals at their own pace (NICHCY, 2019). Educators and policymakers are developing methods where learners advance only; they have demonstrated that they fully understand the content of whatever they are taught in the classroom other than the amount of time spent learning similar content (OSERS, 2020). Many states are working towards increasing bolters readiness for work or college and graduation rates by focusing on secondary school initiatives.

Competency-based learning is a relative a contemporary method of learning design popular with learners and ensemble certain kinds of employers such as searching for mid-level jobs or adult learners seeking to re-skill identifiable skill (Fernández-López et al., 2013). Nonetheless, the US Department of Education (2019) refuted claims in Fernández-López et al. (2013) about the significance of competency-based learning by stating that the efficiency of the approach might be limited to some learners as it does not allow them to venture into higher levels, more abstract skills and knowledge requiring decision-making and critical thinking, and high-level problem-solving. The study scrutinized the significance of special education teacher competency in ensuring the realization of inclusive education, yet other formal variables such as availability of support and attitude could also be influential. Since this study revealed the need for in-service training and pre-service training of teachers in effective and successful inclusive education, future studies could propose and examine models of in-service and pre-service teachers' training for inclusive education.

#### **4.4 Chapter Summary**

The chapter has successfully presented a discussion of the eight themes generated from evidence in the 10 studies included in the systematic review of literature about the modern

pedagogical approaches for SEN learners. The identified teaching and learning strategies that can help in improving the quality of education and academic outcomes among learners with SEN include flipped classroom, problem-based learning, project-based learning, cooperative learning, design thinking approach, gamification, thinking-based learning, and competency-based learning. Even though these pedagogical approaches have a common goal of enhancing the inclusivity of SEN learners into mainstream education and increasing their academic performance, they have received varying forms of criticisms. For example, project-based learning and problem-based learning have been criticized for their inability to lead to improved academic performance and enhanced inclusivity in education if they are not properly moderated by teachers. Furthermore, the need to conduct in-service training for both special education and mainstream teachers was identified as an important strategy for increasing teacher competency and providing them with adequate knowledge required for the implementation of these pedagogical approaches. In the next chapter, the research questions for this study are restated and assessed. Recommendations for future research and educational practice are also provided in the next chapter.

## **Chapter Five: Conclusion and Recommendations**

### **5.1 Introduction**

The main aim of this chapter is to provide conclusive remarks about the conducted research. The research questions are restated in order to determine whether they were successfully answered based on the generated outcomes. Weaknesses of the study and recommendations for future research are also provided in this chapter. The main goal of this study is to generate knowledge that can be used for improving the quality of special education programs and enhancing the inclusion of SEN learners into mainstream school settings. Therefore, recommendations of how the produced knowledge can be used for achieving such goals are explained.

### **5.2 Conclusion**

All three research questions for this review were successfully answered. The first research question involved an assessment of the types of pedagogical approaches that have the greatest impacts on intellectual developments among the SEN learners. The review has identified eight pedagogical approaches for special education, they include flipped classroom, project-based learning, cooperative learning, gamification, problem-based learning, design thinking approach, thinking-based learning, and competency-based learning. All of these pedagogical approaches are focused on improving the quality of special education services offered to the SEN learners and the creation of conducive learning environments. Within the flipped classroom setting, instruction is transferred from a group learning environment to an individual learning environment, and that the succeeding group space is altered to form a dynamic, collaborative learning environment within which the students are guided by their teachers as they apply the concepts and engage creatively during the learning process. Therefore, the principle of flipped classroom approach is different from those of project-based learning and problem-based learning where the learning process is

mainly executed through group discussions. Gamification is also currently being used by most special education schools to increase engagement among SEN students and improve their performance, both academically and socially.

The second research question focused on identifying the most appropriate pedagogical approaches for ensuring improved learning outcomes within the mainstream school setting. Out of the eight teaching and learning approaches identified, thinking-based learning, competency-based learning, problem-based learning, and project-based learning were identified to be more applicable within the mainstream school setting. Competency-based learning is widely employed by most of the mainstream schools selected for inclusive education because it is highly flexible, allows students to work at the own pace, ensures personalization of teaching and learning strategies, purpose-driven, and characterized by timely support. However, project-based learning and problem-based learning have been criticized on the basis that they may not lead to the realization of positive outcomes among SEN learners with communication and social skill limitations. Therefore, SEN teachers should undergo regular training on how to successfully implement these pedagogical tactics with the intention of facilitating the realization of positive outcomes. With reference to the strategies that the schools can use to best manage the transition from early years to school and minimization of negative effects on SEN learners, this study acknowledged the need to conduct in-service training for both special education teachers and mainstream teachers as well as the creation of public awareness on the significance of embracing and supporting children with special educational needs to meet their academic goals.

### ***5.2.1 Limitations of the Study***

Collection and analysis of comprehensive data for critical review are achieved by conducting literature data searches on many databases. Nonetheless, the literature search process

was conducted on only three databases: Education Full Text, Linguistics and Language Behavior Abstracts, and PsycINFO hence limiting the identification, selection, and reviewing of many studies about the pedagogical approaches for SEN learners. Despite the availability of many studies about SEN learners and special education pedagogical approaches, the present review only included 10 studies for view; an approach that limited the comprehensiveness of generated outcomes. SEN learners have varying needs depending on the type of health problem they are experiencing. Nonetheless, the present review critically appraised general evidence about the special education pedagogical approach without specifying the type of SEN group being targeted. For that matter, the application of this study's outcomes to a specific SEN group such as children with autism and learning disabilities was limited. Despite the fact that all the reviewed studies were selected from reputable databases, the authenticity and originality of the secondary data collected for analysis could not be proved.

### **5.3 Recommendations**

#### ***5.3.1 Recommendations for Special Education Practice***

Results from this review can be used for developing strategies for improving the efficiency of special education delivery and ensuring inclusive education in the U.S. For example, this review identified eight pedagogical approaches that can be adopted by special schools and mainstream schools selected for inclusive education programs. The techniques require different types of resources for their implementation. Therefore, special schools and mainstream schools selected for the inclusion of SEN learners need to conduct a cost-benefit analysis of the pedagogical approaches in order to identify the most appropriate ones based on the SEN learners' groups being targeted. For example, project-based learning and problem-based learning mainly encourage learning through group discussions and they might not be effective on students with

communication and social skill problems, as in the case of autistic students when not properly moderated by teachers. The present review also identified in-service training for both special education and mainstream teachers as a key strategy for increasing their competency and ability to address the needs of SEN students. Therefore, all the school districts need to develop both voluntary and compulsory special education training programs for all teachers and parents. The review showed that teachers play an imperative role in the efficacious enactment of inclusive education programs and the development of new pedagogical techniques. Therefore, the training programs should be focused on improving the design thinking capabilities of teachers and other stakeholders within the special education sector in order to help the SEN learners realize their academic and social goals, similar to their non-SEN colleagues. Even though inadequate resources have been identified to limit the successful implementation of inclusive education programs, perceptions and attitudes of non-SEN students and mainstream teachers towards the SEN learners cannot be ignored. Therefore, the US Department of Education can use the evidence presented in this review to harmonize the learning environments and to ensure the inclusion of SEN students into the mainstream schools.

### ***5.3.2 Recommendations for Future Research***

Even though the present review achieved its key purpose of critically appraising previous evidence on pedagogical approaches for SEN learners, there are still areas that require further research. Further research should consider collecting and analyzing primary data in order to address the limitations associated with the use of secondary data. Specifically, the researcher could not prove the authenticity and originality of the secondary data. Future study may choose to adopt pure qualitative, quantitative and mixed research approach in order to generate more comprehensive outcomes and develop additional evidence about SEN learners and special

education. However, quantitative and mixed research methods approaches are the most recommended for future research as a significant percentage of the previous studies on special education and modern pedagogical approaches have adopted a qualitative approach. Based on the fact that different learners with SEN often have varying forms of needs, future research should assess the efficiency of pedagogical approaches specific to a given type of students with SEN. For example, the study may select to examine teaching and learning approaches for autistic children or those with learning disabilities, so that the generated outcomes may be used to improve pedagogical practices for the involved studies. Additionally, most of the previous studies about the efficiency of pedagogical approaches for SEN learners have collected data from special education teachers and other specialists but not from the students themselves. Therefore, future research should include SEN learners in their studies in order to improve the comprehensiveness of evidence to be developed. Additional research should also assess the role of technology in the development and implementation of special education pedagogical approaches and inclusion of SEN learners into mainstream education. There is still limited evidence about the efficiency of the blended approach in ensuring inclusive education; hence another important area for future research.

## REFERENCES

- An, Y. J., & Reigeluth, C. (2011). Creating technology-enhanced, learner-centered classrooms: K–12 teachers' beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education*, 28(2), 54-62. <https://doi.org/10.1080/21532974.2011.10784681>
- Aromataris, E., & Pearson, A. (2014). The systematic review: An overview. *The American Journal of Nursing*, 114(3), 53-58. <https://doi.org/10.1097/01.NAJ.0000444496.24228.2c>
- Aromataris, E., & Riitano, D. (2014). Constructing a search strategy and searching for evidence. *American Journal of Nursing*, 114(5), 49-56. <https://doi.org/10.1097/01.NAJ.0000446779.99522.f6>
- Bauminger-Zviely, N., Eden, S., Zancanaro, M., Weiss, P. L., & Gal, E. (2013). Increasing social engagement in children with high-functioning autism spectrum disorder using collaborative technologies in the school environment. *Autism*, 17(3), 317-339. <https://doi.org/10.1177/1362361312472989>
- Bearman, M., Smith, C. D., Carbone, A., Slade, S., Baik, C., Hughes-Warrington, M., & Neumann, D. L. (2016). Systematic review methodology in higher education. *Higher Education Research & Development*, 31(5), 625-640.
- Brocke, J. V., Simons, A., Niehaves, B., Niehaves, B., Reimer, K., Plattfaut, R., & Cleven, A. (2019). Reconstructing the giant: On the importance of rigour in documenting the literature search process. In S. Newell, E. Whitley, N. Pouloudi, J. Wareham, & L. Mathiassen (Eds.), *Proceedings of 17th European Conference on Information Systems (ECIS 2009)* (pp. 2206-2217). <https://aisel.aisnet.org/ecis2009/161>

- Ciullo, S., Falcomata, T., & Vaughn, S. (2015). Teaching social studies to upper elementary students with learning disabilities: Graphic organizers and explicit instruction. *Learning Disability Quarterly, 38*(1), 15-26. <https://doi.org/10.1177/0731948713516767>
- Coates, A. (2020). The prevalence of philosophical assumptions described in mixed methods research in education. *Journal of Mixed Methods Research. https://doi.org/10.1177/1558689820958210*
- Crowther, M., Lim, W., & Crowther, M. A. (2017). Systematic review and meta-analysis methodology. *Blood, 116*(17), 3140-3146.
- de FSM Russo, R., & Camanho, R. (2015). Criteria in AHP: A systematic review of literature. *Procedia Computer Science, 55*, 1123-1132. <https://doi.org/10.1016/j.procs.2015.07.081>
- DeLuca, J. B., Mullins, M. M., Lyles, C. M., Crepaz, N., Kay, L., & Thadiparthi, S. (2018). Developing a comprehensive search strategy for evidence based systematic reviews. *Evidence Based Library and Information Practice, 3*(1), 3-32. <https://doi.org/10.18438/B8KP66>
- Fernández-López, Á., Rodríguez-Fórtiz, M. J., Rodríguez-Almendros, M. L., & Martínez-Segura, M. J. (2013). Mobile learning technology based on iOS devices to support students with special education needs. *Computers & Education, 61*, 77-90. <https://doi.org/10.1016/j.compedu.2012.09.014>
- Ferreras-Fernández, T., Martín-Rodero, H., García-Peñalvo, F. J., & Merlo-Vega, J. A. (2016). The systematic review of literature in LIS: An approach. In F. J. García-Peñalvo (Ed.), *Proceedings of the Fourth International Conference on Technological Ecosystems for Enhancing Multiculturality*, 291-296. ACM. <https://doi.org/10.1145/3012430.3012531>

- Guo, Z., Yang, H., Wang, S., Zhou, C., & Liu, X. (2018). Adaptive harmony search with best-based search strategy. *Soft Computing*, 22(4), 1335-1349. <https://doi.org/10.1007/s00500-016-2424-3>
- Hart, C. (2001). *Doing a literature search: A comprehensive guide for the social sciences*. SAGE Publications.  
<https://books.google.com.ua/books?id=RgfJYgLGZiwC&printsec=frontcover&hl=ru#v=onepage&q&f=false>
- Haydon, T., Hawkins, R., Denune, H., Kimener, L., McCoy, D., & Basham, J. (2012). A comparison of iPads and worksheets on math skills of high school students with emotional disturbance. *Behavioral Disorders*, 37(4), 232-243.  
<https://doi.org/10.1177/019874291203700404>
- Kauffman, J. M., Hallahan, D. P., Pullen, P. C., & Badar, J. (2018). *Special education: What it is and why we need it*. Routledge. <https://doi.org/10.4324/9781315211831>
- Larsson, O. S., & Brandsen, T. (2016). The implicit normative assumptions of social innovation research: Embracing the dark side. In A. Zimmer, A. Evers, S. Cattacin, & T. Brandsen (Eds.), *Social innovations in the urban context* (pp. 293-302). Springer.  
[https://doi.org/10.1007/978-3-319-21551-8\\_24](https://doi.org/10.1007/978-3-319-21551-8_24)
- Luchini, C., Stubbs, B., Solmi, M., & Veronese, N. (2017). Assessing the quality of studies in meta-analysis: Advantages and limitations of the Newcastle Ottawa scale. *World Journal of Meta-Analysis*, 5, 1-48. <https://doi.org/10.13105/wjma.v5.i4.80>
- Marino, M. T., Gotch, C. M., Israel, M., Vasquez III, E., Basham, J. D., & Becht, K. (2014). UDL in the middle school science classroom: Can video games and alternative text heighten

- engagement and learning for students with learning disabilities? *Learning Disability Quarterly*, 37(2), 87-99. <https://doi.org/10.1177/0731948713503963>
- McGowan, J., Sampson, M., Salzwedel, D. M., Cogo, E., Foerster, V., & Lefebvre, C. (2016). PRESS peer review of electronic search strategies: 2015 guideline statement. *Journal of Clinical Epidemiology*, 75, 40-46. <https://doi.org/10.1016/j.jclinepi.2016.01.021>
- McKeever, L., Nguyen, V., Peterson, S. J., Gomez-Perez, S., & Braunschweig, C. (2015). Demystifying the search button: A comprehensive PubMed search strategy for performing an exhaustive literature review. *Journal of Parenteral and Enteral Nutrition*, 39(6), 622-635. <https://doi.org/10.1177/0148607115593791>
- Mijnhout, G. S., Hooft, L., van Tulder, M. W., Devillé, W. L., Teule, G. J., & Hoekstra, O. S. (2020). How to perform a comprehensive search for FDG-PET literature. *European Journal of Nuclear Medicine*, 27(1), 91-97. <https://doi.org/10.1007/pl00006669>
- Moskalewicz, A., & Oremus, M. (2020). No clear choice between Newcastle–Ottawa scale and appraisal tool for cross-sectional studies to assess methodological quality in cross-sectional studies of health-related quality of life and breast cancer. *Journal of Clinical Epidemiology*, 120, 94-103. <https://doi.org/10.1016/j.jclinepi.2019.12.013>
- Mourão, E., Kalinowski, M., Murta, L., Mendes, E., & Wohlin, C. (2017). Investigating the use of a hybrid search strategy for systematic reviews. In *2017 ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM)* (pp. 193-198). IEEE. <https://doi.org/10.1109/ESEM.2017.30>
- NCD. (2019). *Turning rights into reality: How guardianship and alternatives impact the autonomy of people with intellectual and developmental disabilities*. <https://ncd.gov/publications/2019/turning-rights-into-reality>

- NCES. (2020). *The condition of education: Students with disabilities*.  
[https://nces.ed.gov/programs/coe/indicator\\_cgg.asp](https://nces.ed.gov/programs/coe/indicator_cgg.asp)
- NDA. (2018). *How America responds to special education needs: Past, present, and future*.  
<http://nda.ie/Publications/Education/Education-Publications-/Student-Journeys-/2-How-America-Responds-to-Special-Education-Needs/How-America-Responds-to-Special-Education-Needs-Past-Present-and-Future.html>
- NICHCY. (2018). *Early childhood language summits build collaboration, community among Native American tribes*. <https://www.fhi360.org/news/early-childhood-language-summits-build-collaboration-community-among-native-american-tribes>
- NICHCY. (2019). *National resources for parents of children and youth with disabilities*.  
<https://www.washington.edu/doit/national-resources-parents-children-and-youth-disabilities>
- Okolo, C. M., & Diedrich, J. (2014). Twenty-five years later: How is technology used in the education of students with disabilities? Results of a statewide study. *Journal of Special Education Technology*, 29(1), 1-20. <https://doi.org/10.1177/016264341402900101>
- OSEP. (2019). *OSEP releases fast facts on children with disabilities aged 3 through 5*.  
<https://sites.ed.gov/osers/2020/10/osep-releases-fast-facts-on-children-3-through-5/>
- OSERS. (2020). *Department releases COVID-19, IDEA-related Q-and-A*.  
<https://sites.ed.gov/idea/departments-releases-covid-19-idea-related-q/>
- Paez, A. (2017). Gray literature: An important resource in systematic reviews. *Journal of Evidence-Based Medicine*, 10(3), 233-240. <https://doi.org/10.1111/jebm.12266>

- Patino, C. M., & Ferreira, J. C. (2018). Inclusion and exclusion criteria in research studies: Definitions and why they matter. *Jornal Brasileiro de Pneumologia*, 44(2), 84-84. <https://doi.org/10.1590/s1806-37562018000000088>
- Reed, F. D. D., Hyman, S. R., & Hirst, J. M. (2011). Applications of technology to teach social skills to children with autism. *Research in Autism Spectrum Disorders*, 5(3), 1003-1010. <https://doi.org/10.1016/j.rasd.2011.01.022>
- Reinke, W. M., Stormont, M., Herman, K. C., Puri, R., & Goel, N. (2011). Supporting children's mental health in schools: Teacher perceptions of needs, roles, and barriers. *School Psychology Quarterly*, 26(1), 1-13. <https://doi.org/10.1037/a0022714>
- Sermier Dessemontet, R., & Bless, G. (2013). The impact of including children with intellectual disability in general education classrooms on the academic achievement of their low-, average-, and high-achieving peers. *Journal of Intellectual and Developmental Disability*, 38(1), 23-30. <https://doi.org/10.3109/13668250.2012.757589>
- Stang, A., Jonas, S., & Poole, C. (2018). Case study in major quotation errors: a critical commentary on the Newcastle–Ottawa scale. *European Journal of Epidemiology*, 33(11), 1025-1031. <https://doi.org/10.1007/s10654-018-0443-3>
- Stern, C., Jordan, Z., & McArthur, A. (2014). Developing the review question and inclusion criteria. *AJN The American Journal of Nursing*, 114(4), 53-56. <https://doi.org/10.1097/01.NAJ.0000445689.67800.86>
- US Department of Education. (2016). *U.S. Department of Education releases guidance on civil rights of students with disabilities*. <https://www.ed.gov/news/press-releases/us-department-education-releases-guidance-civil-rights-students-disabilities>

- US Department of Education. (2017). *Yonkers (N.Y.) public schools commit to addressing problems serving students with disabilities*. <https://www.ed.gov/news/press-releases/yonkers-ny-public-schools-commit-addressing-problems-serving-students-disabilities>
- US Department of Education. (2019). *About Individuals with Disabilities Education Act (IDEA)*. <https://sites.ed.gov/idea/about-idea/>
- Vom Brocke, J., Simons, A., Riemer, K., Niehaves, B., Plattfaut, R., & Cleven, A. (2015). Standing on the shoulders of giants: Challenges and recommendations of literature search in information systems research. *Communications of the Association for Information Systems*, 37(1), 9-19. <https://doi.org/10.17705/1CAIS.03709>
- Vrabel, M. (2015). Preferred reporting items for systematic reviews and meta-analyses. *Oncology Nursing Forum*, 42(5), 552-560. <https://doi.org/10.1188/15.ONF.552-554>
- Wolgemuth, J. R., Hicks, T., & Agosto, V. (2017). Unpacking assumptions in research synthesis: A critical construct synthesis approach. *Educational Researcher*, 46(3), 131-139. <https://doi.org/10.3102/0013189X17703946>

## Appendices

### Appendix 1: Newcastle-Ottawa Scale (NOS) for Quality Assessment

**Figure 3: Newcastle-Ottawa Quality Assessment Form. Adopted from Stang, Jonas and Poole (2018)**

#### Newcastle-Ottawa Quality Assessment Form

Note: A study can be given a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability.

##### Selection

- 1) Representativeness of the exposed cohort
  - a) Truly representative (*one star*)
  - b) Somewhat representative (*one star*)
  - c) Selected group
  - d) No description of the derivation of the cohort
- 2) Selection of the non-exposed cohort
  - a) Drawn from the same community as the exposed cohort (*one star*)
  - b) Drawn from a different source
  - c) No description of the derivation of the non exposed cohort
- 3) Ascertainment of exposure
  - a) Secure record (e.g., surgical record) (*one star*)
  - b) Structured interview (*one star*)
  - c) Written self report
  - d) No description
  - e) Other
- 4) Demonstration that outcome of interest was not present at start of study
  - a) Yes (*one star*)
  - b) No

##### Comparability

- 1) Comparability of cohorts on the basis of the design or analysis controlled for confounders
  - a) The study controls for age, sex and marital status (*one star*)
  - b) Study controls for other factors (list) \_\_\_\_\_ (*one star*)
  - c) Cohorts are not comparable on the basis of the design or analysis controlled for confounders

##### Outcome

- 1) Assessment of outcome
  - a) Independent blind assessment (*one star*)
  - b) Record linkage (*one star*)
  - c) Self report
  - d) No description
  - e) Other
- 2) Was follow-up long enough for outcomes to occur
  - a) Yes (*one star*)
  - b) No

Indicate the median duration of follow-up and a brief rationale for the assessment above: \_\_\_\_\_

- 3) Adequacy of follow-up of cohorts
  - a) Complete follow up- all subject accounted for (*one star*)
  - b) Subjects lost to follow up unlikely to introduce bias- number lost less than or equal to 20% or description of those lost suggested no different from those followed. (*one star*)
  - c) Follow up rate less than 80% and no description of those lost
  - d) No statement