

What Type of Articles Are Published in Prominent Practitioner Journals to Assist Mathematics

Teacher

Name:

Institution:

Date:

Chapter 1:

INTRODUCTION

Mathematics is perceived as one of the technical subjects which challenge many students and teachers both in colleges and high school. Although it brings a lot of challenge to many students and teachers, there are several published and unpublished articles that can help teachers enhance their mathematics teaching both in colleges and high school. The quality of these articles should be verified by educators before they are authorized for use within the classroom. Teachers should not entirely rely on books for teaching the diverse students but should also employ other means of teaching including researching on articles that have relevant information and can assist students in learning more effectively. Many students have a learning disability when it comes to technical subjects such as mathematics and this leads to the question, what does learning disability entail?

According to the national Centre for Learning Disabilities majority of students who access special education services are those predominantly with learning disabilities. There are no accurate parameters used in determining the exact number of students living with disabilities leading to unreliable statistics of such population. The definition of learning disability largely remains a contentious issue because of its dynamics and understanding among different scholars (Mesibov & Shea, 2011; Simpson, 2005). In this case, the learning disability focuses on mathematics and how teachers can effectively use published articles to effectively deliver better learning outcomes to students with problems of learning mathematics.

Federal special education law has the most conventionally agreed definition. They have integrated learning disabilities into special learning disabilities. They further define special learning disabilities as a disorder that affects one or more fundamental psychological processes

used in comprehending and expressing language verbally or through the written form and can affect a person's capability in listening, thinking, speaking, reading, writing, spelling or performing mathematical task. The common types of learning disabilities are dyslexia, dysgraphia and dyscalculia (Mesibov & Shea, 2011; Simpson, 2005).

According to APA, learning disability can also be defined as the disorders that impair learning enough to produce academic outcomes that are below the average expectation for a person's age, intelligence level and schooling. Scholars Kavale, Spaulding and Beam disregards the above definitions with criticism that they are not clearly understood or expressed. They thus offer an alternative definition. Their definition states that specific learning disability is a heterogeneous group of disorders that can greatly derail the usual progress of academic success in about 2 to 3 percent of the student population.

Despite the definitions, specific learning disability has no conventionally reached definition as it is still work in progress by scholars with regard to its causes and effects on social and academic skills of students. There are no directives by the federal government on the means of diagnosing children with learning disabilities. However, some states have adopted two types of models in diagnosis of children with learning disabilities. They include; discrepancy model and response to intervention model.

The discrepancy model is a way of identifying students by comparing gaps in academic skills. This involves studying the gaps between achievement and skills through particular tests, specifically investigating the planning, attention, simultaneous and successive factors of intelligence.

Response to intervention model involves focusing on positive assessment methods which measure student's responses to evidence based interventions. Response to intervention model can be illustrated into two kinds based on differences in individualization and standardization. They include; the problem solving approach and the standard protocol approach.

The problem solving approach studies a child's strengths and weaknesses which are useful in forming proper individualized interventions. It is therefore preferred by practitioners for this reason. On the other hand, the standard protocol approach relies on standardized evidence based interventions that can be customized to individuals or groups of children. It is upon agreement among scholars including Fletcher, Coulter, Reschly and Vaughn that Response to Intervention approach must be applicable in determining the availability of Learning disability in children.

According to a scholar, Givens et al Response to Intervention approach is a practice that seeks to address the academic and behavioral needs of students by offering services which entails some elements. The key elements include; high quality instruction interventions that address the individual needs of students. It also suggests that students should be monitored frequently in order to reach research based decisions. Finally, Givens et al suggests that in the element composition of the Response to Intervention approach should be in such a manner that the student's response data must be considered extensively in educational decision making.

There are a number of stages which students undertake during the response to intervention approach. The three stages are subdivided into; Tier I, Tier ii and Tier iii. In the first stage of understanding the children, Tier I, instructions are provided to some students who are expressing many challenges regarding academics, differentiation and time on task.

In the second stage, Tier ii, the focus is on a smaller number of children who are perceived to have no noticeable changes or improvements from the first stage. This group of people is offered a better approach for good understanding by providing more detailed instructions with emphasis and force.

Tier iii is largely dependent on the progress of the earlier stages. During this stage, the earlier acquired progress reports are widely used to give direction on the required assistance to be offered to the student. To ensure that positive progress reports are achieved, it is necessary to offer close attention and supervision to the students continuously throughout the process.

Response-to-Intervention framework Vs. IQ-achievement Discrepancy Approach

The Local education agencies do make use of the Response-to-Intervention (RTI) approach in determining students experiencing learning disabilities. However, IDEA does not put into consideration whether the response-to-intervention method or the achievement discrepancy model is useful in the identification of the students who are at SLD risk. What this section does is the comparison of the RTI model with IQ-achievement Discrepancy. Through the use of a comprehensive criterion, Lindstrom and Sayeski were able to compare the two models, RTI and IQ-achievement discrepancy. Most scholars have done research and developed their criteria for identifying and drawing comparisons between the two approaches. Their evidencies are either integrated into the models or used to expand what already exists from other scholars. Both the RTI model and IQ-discrepancy lack sufficient reliability as well as discriminated validity. Kids with SLDs as well as those that are low achievers without SLDs cannot be differentiated easily by IQADA. Some cognitive processes and psychological ones which children face are not possibly related to the IQ. Through the use of the evidence-based interventions, the RTI model has the

potential of the problem-solving approach. However, agreement on the “responsiveness” meaning is not provided. For the students who are vulnerable, caution must be taken for the treatment of RIT.

The inefficiency of the assessment procedures is our next concern. IQADA makes its eligibility decisions by only relying on a single score. This is something which is criticized by many. For instance, research shows that reading skills and verbal IQ are correlated very highly and wherein, poor skills in reading can lead to lower IQ scores. This will result in the discrepancy decrease between the achievements and IQ. There is need to improve the assessment procedures since the existing interventions are not as powerful as we think in the elimination of protest differences especially for kids who are at risk for LD. One of the reasons as to why the RTI model is not accepted highly by the school psychologists is probably its inability for assessing secondary level procedures and other areas of SLD. Hence, it is lowly accepted.

However, RTI can be improved by practitioners. They can work on improving the utility of the decision procedures involved. They can also employ different classification analysis agreements to do inspection implementations. These approaches also have posted another implication, “wait to fail” concern. The failure of IQADA to identify students in their early grades contributes much to their failure. In other words, it is right to say that IQADA does wait for these students to fail because it is not able to identify their problems in the early grades like in kindergarten. This is due to the inability to show an IQ discrepancy at such a young age. IQADA has to wait there for till these kids are old enough. The methods cannot be used in the provision of academic intervention at early stages (Givens et al., 2007). In RTI, the lack of consistency in the implementation model makes students stay at tiers over a long time duration. Nevertheless, the ambiguous interventions have led to more critiques on the RTI approaches. The approach is

subjective hence leaving teachers to decide the kind of response which should be provided. The model also requires adjustments which are consistent with the performance of the students.

In order to improve the RIT effectiveness, there is a need for experts in different SLDs to be employed. The predictive utility of these models is poor. For instance, the IQ-discrepancy does predict poorly the response to intervention and recognition which is based on the performance profiles of the concerned population. Furthermore, it does not play a part in improving treatment. Early screening for RTI might be less valid. The measures used for RTI in the kindergarten kid might provide wrong interventions for slightly older children. Some students show no response to the interventions when on RIT framework. According to researchers, there is a need for professionals to conduct more research and find out some of the other psychological problems/processes, which might be hindering the academic performance of students (Givens et al., 2007).

Problem statement

Discrepancy and RTI models are used in identifying students with learning disorders (LD). These two methods have their different ways of assessing the problem. LDs do affect the students' academic outcome. Most people connect a student's failure to social, cultural, sociolinguistic or low educational facilities. This is not often the case with learning disorders; they are not attached to any of these challenges. LD is dominant in students accessing the special education services. The LDs have different impacts on the students' academic skills, and if interventions are not done properly in time, students are likely to suffer in their performance and their social functioning affected as well. This calls for the need to help these students. The government, the schools, and the entire community should play their vital roles in the identification of students with LDs. They

should ensure that these children get access to proper treatment as well as the right academic interventions (Reichow, Volkmar, & Cicchetti, 2008).

Objective of the study

This study was made to describe the category, degree, and value of teaching procedures using scientific evidence-based practice strategies for students with Learning Disabilities in mathematics. Teachers need access to new and operative resources to help learners with Learning Disabilities, as required by the IDEA Act of 2004 and NCLB Act of 2001. They require enhancing their expertise and abilities and recognizing new ways to help their students. This document offers a brief exposition of articles from two professional journals dedicated to special education published between 2003 and 2013.

Investigation Questions

The research questions are stated below:

1. What kinds of articles are published to aid teachers working with students who have learning disabilities in mathematics?
2. What are the features of the published literature related to helping students with learning disabilities?
3. To what extent are the qualities of these articles relevant to the teaching and learning mathematics?

Hypotheses

The hypotheses are presented below:

1. The information published by professional journals is unfailing and secure and was obtained through scientific methods.
2. The studies published are based on evidence gotten through experimentation and data recollection.
3. Most of the publications can be used by teachers in inclusive and non-inclusive classrooms.

Importance of the study

The study aims to help teachers to learn more about evidence-based practices. The objective is to synthesize the latest evidence-based interventions used and tested nowadays and generate a compendium of knowledge. Specifically, the worth of the study is related to:

1. To decrease the lack of specialized literature regarding the interests of teachers of special education.
2. The creation of a synthesis that would directly help special education teachers by organizing data of evidence-based practices from different organizations.
3. And finally to offer a guide based on research that would facilitate the interventions and relationships with students with learning disabilities in grades K-12.

Method of Procedure

The study used quantitative and descriptive methods of research and it is concentrated on the current instructional efficacy of 18 procedures mentioned by the Teaching LD website.

Selection of Sample

The study used two professional journals with content related to practices used on children with Learning Disabilities. The journals were: Intervention in School and Clinic (ISC) and

Teaching Exceptional Children (TEC). The articles used in the research were published between 2003 and 2013.

Collection of Data

Step 1: The obtaining of the volumes of the mentioned journals published since 2003.

Step 2: The organization of the data, downloading the articles and converting them to PDFs.

Treatment of the Data

Data were examined and described according to developed coding sheet.

Definitions of Terms

Teaching methods. They are proved systems that teachers use to educate students with their program and they can include all kinds of interventions used upon different students (Horner et al., 2005; Kazdin, 1982). Teaching methods are the strategies and the different ways a teacher delivers some knowledge. Generally, every teacher has their methods.

Intervention. It is an approach used to make the students increase their accomplishment in the classroom. The word has the same meaning as expressions related to actions performed by teachers to impart knowledge to their students (Reichow, Volkmar, and Cicchetti, 2008). Every action performed by a teacher to make a student learn something is an intervention.

Strategy. It is the planning of different types of actions that can be used to deliver content to students and improve their success (Reichow et al., 2008). The strategy is the planning of effective interventions.

Teaching practices. They are the application of known methods of teaching that new and original interventions designed to increase the students' knowledge.

Evidence-Based Practice: it is a procedure that has demonstrated positive results on students when it was tested experimentally (Mesibov & Shea, 2011; Simpson, 2005). According to law, No Child Left Behind Act (NCLB), evidence-based investigation implies the application of recognized, methodical, and exact processes to gain comprehension pertinent to educational environments and activities (NCLB, 20 U.S.C 7801 § 9101[37]). In other words, the practice has been tested several times in different contexts and has demonstrated its effectiveness.

Limitations

This study has very restrictions because it is only based on the articles published in two professional journals between the years 2003-2013. The interventions studied were the 18 teaching interventions mentioned in the TeachingLD.org website. Hence it has limitations in the sources used and the timeframe of the investigations published in Teaching Exceptional Children and Intervention in Schools and Clinic. Third, the study was also limited to the resources and organizations used for the research and synthesis. It is possible to replicate the study using different combinations of factors (Fletcher et al., 2004).

CHAPTER TWO

Review of the Literature

Calculus is one field of study that has over the year received attention in the education system in the United States and around the world. As identified by various researchers, the introductory calculus has for a long time scared the prospective undergraduates who dream to pursue STEM, Science, Technology, Engineering and Mathematics, courses. Most of the students who are enrolled in Calculus class are mostly first-time freshmen and mathematics, and science classes are where students transitioning to higher education are most likely to struggle (Dibbs, 2015). Among the first time students who struggle much in calculus and are most likely to switch are English-language students, the new generation college student, women, and rural high schools among others. The disparity in the performance of students in Calculus coupled with the trends in STEM courses has prompted researchers to carry out studies to establish the best way to address the challenges students experience that deter their efforts in performing better in Calculus. Consequently, the teachers and practitioners seek to identify the suitable strategies to implement and be knowledgeable about evidence-based practices that would help boost the ability of students in different grades perform better (Speer & Kung, 2016).

This chapter will provide brief descriptions concerning the various issues including; why calculus matters, retaining STEM intending students, minority student, switchers, curriculum aspects and Clear calculus, and Calibration about Undergraduate mathematics education, Secondary mathematics education and secondary mathematics education, and mathematics teacher education (Dibbs, 2015).

Undergraduate Mathematics education

The students' success in undergraduate mathematics has significant implications regarding student choice of STEM majors and related career. Also, the students who do not intend to major in STEM-related courses hardly succeed in undergraduate mathematics as Calculus breaks their decisions to persist in postsecondary education. Despite the attempt to make the learning of calculus lean and lively through reformations, the performance and attitude of the students in undergraduates' mathematics education have not changed much. According to Dibbs, (2015) the switchers are less likely to have a feeling of connection with their instructors. The increasing utilization of formative assessment, low state on assignments for instructional planning purposes may positively contribute to more students prospective students being retained in STEM major courses. Besides, the use of formative assessment in undergraduate is one better way to increase students' positive perception of the instructor. The students would be more likely to seek help from their instructors thereby enabling their instructors to make data-based decisions on how many reviews instructions should be incorporated into a similar unit (Speer & Kung, 2016). On the application of approximation framework, the regular participants would appropriate almost all limit concepts embedded in the approximation framework while the irregular participants show minimal conceptual acquisition beyond the procedural fluency. The students' participants can thus be grouped into regular participants and irregular participants. The students who regularly participants in the formative assessment missed a maximum of two out of the twelve evaluation conducted in a semester. The regular participants earned much higher grades in the calculus limit classes as others earned every possible final grade in every level of participation.

The students' success in undergraduate mathematics pre-calculus through calculus II can be achieved through the development of curriculum and materials that focus on effective

teaching practices. Additionally, conducive teaching environment, students reasoning interaction and problem-solving contribute to the success of learning calculus. Studies in transformation in the approach to calculus and instructional improvements in undergraduate calculus due to formative assessment have demonstrated improved learners disposition towards mathematics and persistence in taking subsequent courses.

Secondary Mathematics Education

The teaching and content of mathematics in U S have transformed over the years to encourage female students, and other prospective switchers maintain their dreams n taking STEM-related courses. As a result, the K-12 curriculum framework was developed to encourage the teaching and learning of mathematics including teachers' experience. The secondary school mathematics was topically designed and suited to enable students to be college ready. These consisted of the description process and practices of how students should engage in mathematics, expectations, and outcomes that the program needs to have on the students (Dibbs, 2015).

The standardization of mathematics program through transformation was t ensure that students make sense of the problem and persevere in solving them, to reason abstractly and quantitatively and to present reasonable arguments and critique others thought pattern among others. The mathematical practice intended to address the intellectual habits that the program should model for learners to develop in them the associated behavior and cognitive skills. Additionally, the modification of the school mathematics program was to raise the ability of the system to produce secondary school graduates who were college and career ready in mathematics. The goal could be achieved by students understanding the mathematics as a structure, reasoning, and procedure that makes sense and that they gain the ability to reason with and use mathematics. The teaching of mathematics in America is progressive with the students

being taught complex mathematical problems as they age. In the elementary school, the learners are taught basic arithmetic including addition, subtraction, division, and multiplication. The general mathematics curricula in high school include algebra 1, geometry, algebra 2, pre-calculus and calculus.

Algebra 1

The study of algebra focuses on the rules of relations and operations and the constructions and concepts that arise from them as well as their applications to solve a problem. The pre-algebra is taught in middle school and introduces the basic concepts of polynomials and variables thereby linking elementary arithmetic and advanced arithmetic. The algebra involves the study of polynomials, algebraic structures, and equations and opens the way for the students to take calculus as well as other advanced mathematics courses (Speer & Kung, 2016).

Geometry

Geometry is a general fundamental subject in high school though may be introduced in lower grades in some schools. The geometry in mathematics is about size, shape, and the properties of space as well as the relative positions of figures. It deals with measurements including lengths, areas, volumes, circumference angles among others. It is categorized into differential geometry, algebraic geometry, solid geometry and much more.

Algebra II

Algebra II is an advanced algebra I. it too focuses on the relationships and operations and the concepts that contribute to the solving of the problems. It thus majors on the advanced arithmetic. It also contributes to further students' preparations and understanding of Calculus.

Pre-calculus

Calculus is the study of change. The US students who pursue STEM courses. High school precalculus is an advanced forms of algebraic mathematics and students a path to calculus and college-level mathematics. It can, therefore, be concluded that the study of precalculus in one crucial step in students understanding of the concepts to come. The precalculus forms the initial stages which when not properly taught may affect the students' performance in the central calculus thus hindering them from going for STEM career courses.

Calculus

Calculus is a form of mathematical concept that was developed from algebra and geometry. It is classified into differential calculus and integral calculus. The differential calculus involves the study of small components that make up the whole system while integral calculus studies the entire system as an accumulation of small elements. Most learners at high school level find learning of calculus challenging. Many attribute this to weak foundation and understanding of the functions, as well as an inability to use functions to reason and give a relationship. Teaching calculus entails the provision of a list of procedures to follow and can be better understood through routine algebraic manipulations (Speer & Kung, 2016). Since calculus is the study of change, it is applicable in everyone daily life.

Mathematics Teacher Education

The success of students largely depends on the teachers of mathematics they engage with right from prekindergarten to grade 12. It thus goes without saying that improving the quality of teachers training would directly translate to the quality of education the student gets. Also, the teachers' preparation programs should at all times ensure that all the students have the knowledge, disposition, and skills needed for students to access the opportunities necessary to ensure they get meaningful experiences with mathematics. The Association of Teachers

Mathematics education has taken it as their responsibility of ensuring that all mathematics teachers from all grade of learning acquire proper training to improve teachers' delivery and students' learning.

The teachers' preparation and practices have an impact on the students' experience in the mathematics classroom. Much focus should as well be put on the teachers' knowledge of the subject, curriculum and the best way the students can learn mathematics. As much as a lot of researchers have shown that teacher's preparation is a prerequisite to better performance, no single comprehensive has been developed to outline what entails the initial qualifications for teachers before a mathematics class. The standards on what the novice mathematics teachers should know or be able to do including the disposition they should have to increase equity, access, and opportunity for the success in mathematics for all the students. It is thus vital for the provision of the general guide that would offer a guide to teachers of mathematics on how best they can prepare for the class.

The association of mathematics teachers has thus developed a guide that would improve the individual's teacher's preparation programs, promote national dialogue and inform the accreditation process, as well as inform actions related to mathematics teacher's preparations. The standard hence serves as aspirations that advocate for teachers' preparation practices to support them in becoming high-quality teachers who are ethical advocates for children and effectively guide students' learning with research and best practices. In developing the teachers' preparation guide mainly to help the beginners to develop professional proficiencies and to raise their effectiveness in their first years of teaching, five assumptions have been made about their preparations (Dibbs, 2015). The assumptions include;

Success to every learner requires an integrated focus on equity in each program that prepares the mathematics teacher. The assumption comes about the uneven performance noted in students from varying demographic factors. Every standard developed must apply to all learners. Equity requires teachers to know and understand the needs and capability of all the learners. Secondly, the long learning is essential for effective teaching of mathematics. The level of competence and understanding of students increases with longtime experience in teaching mathematics. The teachers who have taught mathematics for an extended period understand their students better and develop easy approaches to teaching compared to their first year of teaching. This can be attributed to intentional efforts to learn more knowledge. The standards would help teachers develop competence and expertise on the standard and attention from the initial stages of their teaching, thus becoming the knowledge, skills, and dispositions for a well-prepared beginner. Finally, an effective mathematics teacher preparation program should attract, nurture and produce high-quality teachers of mathematics who are representative of diverse communities.

The third assumption is that learning to teach mathematics requires a central focus on mathematics. The teaching of mathematics requires general pedagogical skills, content-specific knowledge, skills, and disposition. Teachers for better delivery to the students must be flexible and have a more profound understanding of the mathematics they teach to supports students effective learning. Next, the multiple stakeholders should be responsible for and invest in preparing teachers of mathematics. There should be a concerted effort from all quarters to develop teachers to ensure students' future success. The successful teacher's preparation needs a shared vision of mathematics learning outcome for students of effective mathematics learning environment, and the best experience that supports mathematics teachers growth and

development. Finally, individuals involved in teachers' preparation must be committed to improving their effectiveness in the training of the future mathematics teachers.

Among the characteristics of a well-prepared mathematics teacher include knowledge of mathematics. They have the appropriate knowledge of and skills in mathematics necessary for teaching. They thus engage in proper mathematical practices and are supportive of their students. They also can read, analyze and discuss curriculum, assessment and standard documents and the students' mathematical production. Besides, the beginning teachers when well prepared will have a reliable and flexible knowledge of basic mathematical concepts and procedures they will teach the understanding of what they will teach, and the mathematical foundations, ideas, and procedures to deliver to the students. Next, they have solid and flexible knowledge of mathematical processes and practices. They recognize the tools necessary to help students solve problems and communicate ideas as well as understanding the fact that success in mathematics depends on a productive disposition towards the subject and hard work. Additionally, prepared beginning teachers can read, analyze and interpret curriculum, content trajectories, standard documents and assessment frameworks for the grades in which they are being prepared to teach.

The mathematics teachers know to analyze mathematical thinking by employing varying approaches to mathematical work and respond appropriately. Additionally, they must be proficient with tools and technologies designed to support mathematical reasoning and sense making in mathematics and in helping their students of mathematics. Besides, it is a requirement that beginning teachers have foundation of pedagogical content knowledge, efficient and equitable mathematics teaching practices and useful and positive disposition towards teaching mathematics to support learners sense-making, understanding, and reasoning. Beginning teacher must attend to multitude factors such as content, learners learning needs, the selection of tasks

and assessment and in designing mathematical learning and opportunities for students. They also need to implement useful and meaningful mechanisms to aid students to learn mathematics. They must be able to analyze their teachings as practitioners to assess the quality of their presentations to students. The preparation of teachers facilitates the collaboration with their colleagues, families and the society including parents, and caregivers to provide better learning opportunities for students to learn mathematics. They will also be able to understand essential facets of students' mathematical dispositions, devise better ways to sensitize and engage students in mathematics.

Effective programs should be put in place to help prepare beginning teachers of mathematics as they have a significant impact on the quality of the teacher and their experience. The teachers training should focus on providing teachers with opportunities to learn and focus on significant ideas that are essential for understanding the concepts and processes that foster understanding and teaching of mathematics. Secondly, the training programs should impart knowledge of how to teach using mathematics-specific methods causes that integrate mathematics, knowledge of student learners, the social context of teaching and learning mathematics.

CHAPTER 3: METHODS

Overview

A review of the student's performance, as well as their enrolment number, rationale and teachers' objectives statements, syllabus content and the assessment practices of curricula documents the accredited bodies that are responsible to appraising teachers performance, were conducted.

Study Design

The study utilized quantitative research method. The participants were selected from two introductory calculus courses that were taught by use of approximation framework. The students that in most cases register calculus students are predominantly engineering, chemistry, and mathematics major. The stratified sampling was used to identify colleges and high schools. Forty percent of the students who enroll in colleges are first-generation college students. The sources of data include the interviews, students' assignments, and classroom observations. The quantitative analysis comprised daily students' interviews and classroom observation (Ellis et al., 2016). The students were put into eight groups. Three groups in each class's interaction with the instructors and peer were closely observed. Three groups of regular participants, two mixed groups, one of the irregular participants. On non-class days, the study observed the interaction of the instructors with the students' behavior and class with special attention given to the students observed during class. After the class, ten students selected across the groups were interviewed and asked to explain their answers to determine if they were helped in finding the answer and whether they would want to change their answers. The study employed quantitative data the analyst understand students' conceptual growth during the semester. The observations and interviews indicated the likelihood of peer instruction during the class. However, the irregular participants' only continually understood the procedural computation portion of the class. The assignments generated by every student were collected and for quantitative analysis. The students who kept their initial intention to take more calculus were referred to us Persisters while those who recorded low intentions of taking calculus II at the end of the semester compared to the beginning are referred to us, Switchers (Ellis et al., 2016).

The study examined the characteristic of students who enrolled in Calculus I and either persist or switch out of the mainstream calculus sequence and thus either remain or leave the

STEM pipeline, attending specifically to gender. The study also performed statistical analysis of student change in their intention to take calculus II by sex, comparing Persisters to switchers while controlling the students' preparedness for calculus I, the career aspirations, institutional perception as well as the environment of an institution.

The students' preparedness is determined by looking into the students who previously reported calculus experience and standardized test scores in Math. The career aspirations is determined

Collection of Data

The study focused on two academic journals that are published by two scholars with interest in learning of calculus at different institutional levels. They include "Differential Participation in Formative Assessment and Achievement in Trajectory Calculus" and "Achievement in Introductory Calculus and Women 1.5 Times More Likely To Leave STEM Pipeline After Calculus Compared To Men: Lack Of Mathematical Confidence A Potential Culprit. The journals were obtained online through the website of college mathematics journal and mathematics teachers respectively. They were published between the years 2012 and 2017.

Brief Summary of the Journals

This section gives a summary of the two articles used as samples of the study. The study will focus on the alignment and the type of journal utilized.

Differential Participation in Formative Assessment and Achievement in Trajectory Calculus; the article investigates the student's achievement in introductory calculus by use of formative assessment at two different participatory levels observed in class. The study targets were meant to help teachers and educators understand the learning capability of the students within a category and their conceptual growth in performance over a period. The students who

regularly participated in formative assessment showed growth trajectory than the irregular participants. The journal focuses on the in structural, behavioral and social assessment and techniques and has direct applications to the classroom setting. The article is published four times in a year.

Women 1.5 Times More Likely to Leave STEM Pipeline after Calculus Compared To Men: Lack Of Mathematical Confidence A Potential Culprit; the article targets practitioners, educators, professionals and administrators who work with young people. The study aims to contribute to professional development of instructors and practitioners to provide useful information, resources and approach to improve the education and performance of learners in calculus and other STEM courses (Ellis et al., 2016). It notes the substantial gender gap in the sciences, technology, engineering, and mathematics (STEM) workforce. It sought to investigate the effect of calculus on the student in pursuing STEM fields. It points out low mathematical confidence and not the ability as the reason why women fail to pursue these areas. The study emphasizes the effect of career intentions, students' preparedness and instructor quality as the major factors affecting students' performance in Calculus. The article is published seven times in a year to provide instructors and practitioner with the latest information on instructional techniques, procedures, and strategies to enhance the learning of the students with varying capabilities.

Selection Criteria

The two journals were analyzed for two significant issues including; the students' performance in Calculus, and the teaching recommendations provided in the National Council of Teacher of Mathematics in series or not.

For the inclusion in the synthesis, the articles must have been;

- Published between 2012 and 2017.
- Published in the College Mathematics Journal (Publisher: Mathematical Association of America) and The Mathematics Teacher (Publisher: NCTM).

Coding Terms

Formative assessment; it refers to the written assignment that is graded at the completion of the instructors planning.

The following terms were used on the coding sheet.

1) Article Information

- a. Journal; Differential Participation Formative Assessment and Achievement In

Introductory Calculus

- b. Author; Rebecca-Anne Dibbs
- c. Year; 2016
- d. Number of pages; eight

Second Article

- a. Journal; Women 1.5 Times More Likely To Leave STEM Pipeline after Calculus

Compared To Men: Lack Of Mathematical Confidence A Potential Culprit

- b. Author; Jess Ellis, Bailey K. Fosdick, Chris Rasmussen
- c. Year; 2017
- d. Number of pages; 27

2) Subject. It is an instructional strategy utilized to deliver content to students and improve students' achievement. It comprises terms such as instructional strategies, teaching methods, educational, methods, and educational programs.

Grade level

For Differential Participation in Formative Assessment and Achievement in Introductory Calculus, the study is focusing on post-high school students.

For the journal; Women 1.5 Times More Likely to Leave STEM Pipeline after Calculus Compared to Men: Lack of Mathematical Confidence a Potential Culprit. The study focuses on college students' level where the students begin college with a higher expectation to pursue STEM-related courses but drop out for some reasons mentioned in the article.

Switcher; are learners who showed enough evidence of not taking Calculus II.

Persisters; are students who showed an intention of continuing with Calculus II.

CHAPTER 4 RESULTS

Introduction

The chapter will be presenting the methods used in the study and findings. This study applied synthesis with a qualitative approach. Meta-synthesis refers to an intentional and coherent approach in analyzing data across qualitative studies. It summarizes the previous studies by use of specific research selection and quality criteria to contribute a given knowledge. The systematic review, on the other hand, refers to a defined research questions, identification of related studies, and the appraisal of quality and provision of summary evidence using easy method.

The distinction between meta-synthesis and meta-analysis is that meta-synthesis merges themes and insights obtained from individual qualitative study to generate higher order synthesis that supports the overall understanding of the whole body of research while continuing to value the authenticity of individual studies (Ellis et al., 2016). A systematic review is a technique that compares quantitative research and follows outlined procedures which comprise statistical

analysis of the collected outcomes of studies. The statistical analysis is referred to a meta-analysis.

The reason for this meta-synthesis was to establish and analyze two published journals in which the research study was conducted on the teaching calculus to assist mathematics teacher. The study employed research synthesis with qualitative meta-synthesis process so that analytic technique is employed to examine the relevant scope of studies and their content.

The research questions included:-

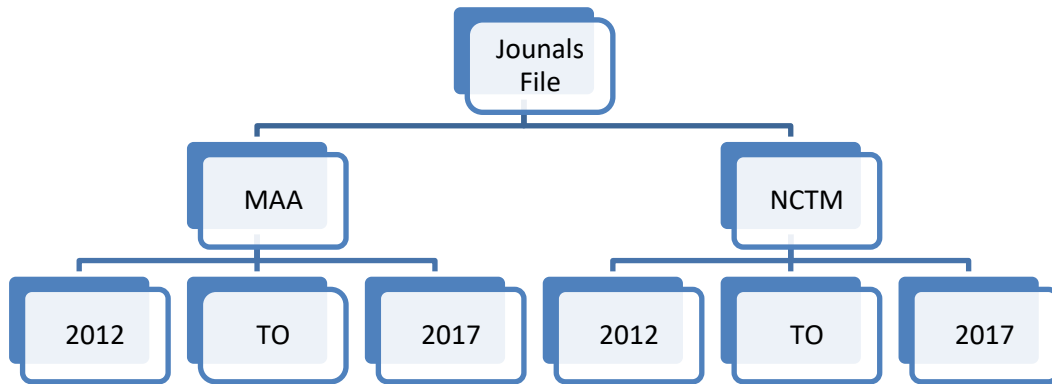
Sample

The study examined issues published in two selected peer-review journal, Women 1.5 Times More Likely to Leave STEM Pipeline after Calculus Compared to Men: Lack of Mathematical Confidence a Potential Culprit. The two journals were selected from the site National Teachers of Mathematics by their contribution in the field of mathematics, especially Calculus. The boundaries of meta-synthesis studies were located between 2012 and 2017.

The constraints in the previous research included time to investigate the level of calibration during the study. Secondly, the investigation failed to measure the students' performance in their calculus courses (Ellis et al., 2016). The study was performed on very few numbers of students and involved no other measure of the students' calculus performance. The study, however, takes advantage of the variety of the methods used by the first researchers. The heterogeneity of the methods employed in a variety of studies offers adequate grounds for testing a theoretical hypothesis regarding the moderators of the relationship that exists in every one of the two studies. The discussions and conclusions provide information concerning population and the relationship of the variables discovered in the initial researches for synthesis.

Procedures

The articles were downloaded one from the college Mathematics Journals published by MAA and Mathematics teachers issued by National Council of Teachers of Mathematics. One of the folders yearly publications of seven articles while the other one had eight releases. The reports were examined using the electronic pdf files.



Data

The meta-synthesis covered a total of 271 articles published in both journals from both websites. The College mathematics journal contained 24 issues published from the year 2012 to 2017 while the Mathematics teachers’ journal contained 247 issues published from 2015 to 2017.

Te the two journals, the total number of issues were 271 contained in approximately 2123 pages. The average of the total number of pages per article was eight.

Number of Articles per year for MAA and NCTM

Year	MAA	NCTM	Total
2012	4	45	49
2013	4	45	49
2014	4	45	49
2015	4	31	35
2016	4	45	49

2017	4	36	40
Totals	24	247	271

Treatment of Data

The codes for the articles were generated after the conduct of the first reading and exploration of other articles. The coding would be necessary for identifying the variables. The coder in collaboration with the advisor sought the clarifications of the ambiguities in the coding scheme. The analysis engaged the second coder to ascertain the reliability of the coding system and moderators.

A coding technique was generated to code data from all the articles. The format adopted integrated the checklist and the coding techniques. The articles were evaluated by seven categories and discrete variables. The first category comprised the information on the identification including the first author's first name, the article title, year, issue and number of pages. The second category is about the article intervention, next is the subject of the study, followed by the grade level. The next category is the setting then the images used and cognitive strategy intervention. Others included the type of the student, teacher, and the research. Every classification was coded with specified numbering process. For example, the images were classified as either relevant or irrelevant. The relevant mages referred to pictures that had positive support o the learners while irrelevant are useless and did not have an illustration that supports the reader (Ellis et al., 2016). The analysis of the data was conducted electronically using SPSS Statistic Desktop Software version 22.0.0.

Inter-rater reliability

40% of the articles were evaluated by a University professor with 10 years' experience. The reliability coefficient initially showed 98%, and the variations were resolved to 100% agreement. The inter-reliability was calculated using the formula;

$$Inter - rater\ reliability = \frac{Total\ number\ of\ agreements}{Total\ number\ of\ agreements + disagreements} * 100$$

Statistical Analysis

From the information in table 2, the total number of issues meta-synthesized from the two journals was 271. The articles were from all the articles were from The College Mathematics Journal and Mathematics Teacher. The number of articles from MAA was 24 (8.86%) while from NCTM journal were 247 (91.14%).

Table 2

Journals' Articles

Journal	frequency	Percent	Valid Percent	Cumulative Percent
MAA	24	8.86%	8.86%	8.86%
NCTM	247	91.14%	91.14%	100%
	271	100%	100%	

Grade Level

The initial studies were sometimes published in the grade. Undergraduate Mathematics education was 45 (16.61%), 25 (9.23%) dealt with educations issues including transformation, policy development, interviews with others. Besides Secondary Mathematics Education article were 54 (19.93%), and Mathematics Teacher Education 78 (28.78%) while 69 (25.46%) were not specified. Table 4 shows results concerning grade levels.

Number of Articles by Grade

Levels

Grade level	Frequency	Perce nt	Valid Percent	Cumulative Percent
Undergraduate	45	16.60	16.60	16.60
Policies and laws	25	9.23	9.23	25.83
Secondary	54	19.93	19.93	45.76
Teachers	78	28.78	28.78	74.54
Unspecified	69	25.46	25.46	100.00
	271	100	100	

Setting

Most of the articles were school based interventions, 120, followed by categories I the settings like society 85, the remaining 66 articles failed to identify settings. The results are summarized in the table below;

Target Setting

Setting	Frequency	Percent	Valid Percent	Cumulative Percent
School	120	44.28	44.28	44.28
Society	85	31.37	31.37	75.65
Others	66	24.35	24.35	100
Total	271.00	100.00	100.00	

Images

There was no use of an image in all articles either relevant or irrelevant.

Cognitive Strategy Instruction

Cognitive skills appeared in 10 (3.69%) articles, the formative assessment was in 12 (4.43%) articles, Switchers, and Persisters in 20 (7.38%) articles (Ellis et al., 2016), the calibration was explained in 30 (11.07%) articles. The curriculum reformation was highlighted in 10 (3.69%) articles, the teachers training 10 (3.69%) and preparation programs appeared many times in 19 (7.01%) articles. The Precalculus and Calculus were explained in 80 (29.52%) articles, the STEM courses were mentioned in 30 (11.07%) articles, algebra 1 and 2 were also mentioned in 20 (7.38%) documents and finally, geometry was explained in 30 (11.07%) articles.

Information from the two MAA and

NCTM

	Frequency	Percent	Valid Percent	Cumulative Percent
Cognitive Skills	10	3.69%	3.69%	3.69%
Formative Assessment	12	4.43%	4.43%	8.12%
Switchers And				
Persisters	20	7.38%	7.38%	15.50%
Calibration	30	11.07%	11.07%	26.57%
Curriculum				
Reformation	10	3.69%	3.69%	30.26%

Teachers Training	10	3.69%	3.69%	33.95%
Preparation Programs	19	7.01%	7.01%	40.96%
Precalculus And				
Calculus	80	29.52%	29.52%	70.48%
STEM Courses	30	11.07%	11.07%	81.55%
Algebra 1 And 2	20	7.38%	7.38%	88.93%
Geometry	30	11.07%	11.07%	100.00%
Total	271	100.00%	100.00%	

The table showing the perception by Switchers and Persisters code and gender

Instructors	<i>Persisters</i>		<i>Switchers</i>	
	Male	Female	Males	Females
Quality	(N=180)	(70)	(55)	(77)
1-2.0	5	2	1	1
2.0- 3.0	8	5	2	2
3.0- 4.0	12	10	7	4
4.0- 5.0	25	13	10	43
5.0-6.0	50	15	15	12
6.0-7.0	80	25	20	15
	180	70	55	77

CHAPTER 5

DISCUSSION

The results from the research showed that students who participate in formative assessment answer more questions compared to those that do not participate and showed a slower rate of improvement throughout the semester. The study also showed that regular participation resulted in the interclass correlation of 30%.

The study also established that there were measurable achievement variations between students who regularly took part in formative assessment compared to those that did not. The differences in calibration between regular and irregular participants are formative assessment. Calibration is regarded as a general metacognitive skill refers to the ability of the learner accurately assess what they know and what they do not know. The reasons for more number of switchers from calculus could be attributed to variations in career goals, the course teaching perception, gender and previous calculus experience.

Besides, teachers' preparation and the programs used in teachers training had a direct influence on the teaching come. More qualified teachers are likely to deliver on calculus than their counterparts who have neither experience nor fail to undergo a competent training program (Speer & Kung, 2016).

Limitations

Despite a large number of articles meta-synthesized, the study had a few limitations including the size of the students sampled for the study. Researchers ought to have increased the number of the articles under the study as well as the number of the selected journals. Secondly, time for conducting the study was limited thereby preventing time for analysis. Finally, the two journals were not adequate in developing detailed meta-synthesis.

Research future

The research focused on the meta-synthesis of practitioner journals to analyze type, rate, and quality of published articles to assist mathematics teacher. This did not cover the kind of programs the teachers should get to equip them with adequate knowledge and skills in teaching. The future research should thus give attention to the teachers training and how it impacts on the performance of the student of mathematics. Secondly, future studies need to focus on the policies and laws guiding the teaching of mathematics and how they reflect on the retaining and commitment of the newly trained teachers.

Recommendations

The articles should be consistent in number, and the additional articles should be increased in number to provide more specific grounds for viable research. Secondly, the keywords are not elaborated in the abstract which should be the case in the subsequent publications.

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