IDENTIFICATION AND ASSESSMENT FOR MEETING NEEDS OF CHILDREN WITH DYSCALCULIA IN NIGERIAN SCHOOLS

***UZAIRU MAMMAN; **ILIYASU UMAR AZARE; ***MUHAMMAD KAWU GABI; & ***GARBA ALHAJI MUHAMMAD**

**Department of Special Education, Federal University Dutsin-ma, Katsina State. **Curriculum and Instructions Department, Aminu Saleh College Of Education, Azare, Bauchi State. ***Department Of Psychology, Aminu Saleh College Of Education, Azare, Bauchi State.*

Abstract

Dyscalculia is a specific learning difficulty affecting children with number processing and arithmetic problems. It is encountered in around 6% to 7% of school – aged children and it has significant implication on society. Without specific intervention, dyscalculia often leads to scholastic failure and school absenteeism. The Identification and Assessment is made when the child's achievement or ability in arithmetic's is significantly below the expected for age, grade and level of intelligence. The remedial instruction has very important role to play as a differentiated instruction which employ different instructional technique through the use of different instructional materials. The paper reviewed some assessment/identification and remediation of children with dyscalculia. It is essential, therefore, that educators in Nigeria be aware of this learning needs of children with such difficulties. It is require for assessment and intervention to support Nigerian Schools children with mathematics difficulties.

KEYWORDS:
Identification and assessment, dyscalculia, learning disabilities, arithmetic skills, intervention

Introduction

The modern-day society is filled with manifestations of numbers and digits everywhere. Be it on the stores, street signs or billboards; numbers are everywhere. Hence, in a school setting, mathematics remains a core and mandatory subject that all students have to learn. Therefore, when a child fails to understand mathematical concepts and skills, the child can easily be left behind in a technology intensive and information science world that exists today, which highly relies on mathematical concepts to get through daily living. There have been a growing number of researches being focused on basic numerical abilities, for example, counting and arithmetic (Landerl, Bevan & Butterworth, 2004). It has been noted that in a pediatric population, about 10% of all the children do face and continue to face difficulties when it comes to learning basic mathematical skills. Out of the 10%, only 3-7% satisfied the diagnostic criteria of a mathematics-based disorder, which in this case is also known as dyscalculia. Dyscalculia remains greatly under appreciated. Both the individual and society get to suffer the burden of having a poor mathematical ability.

Mathematics difficulty is one of the most challenging disabilities given the difficulties in getting formal diagnosis even though dyscalculia is not consequences of inappropriate pedagogical methods, appropriate knowledge and educational practice used with pupils with this disability are essential to a successful intervention (Sausa, Dias, and Cadime, 2016). Mathematics' difficulties are identified through variety of procedures usually the class room teacher or parent observes that the child is having persistent difficulty learning mathematics and tends to perform poorly on classroom math assignments compared to the rest of the class, for example, the child may have trouble remembering what the teacher has taught or he/she may have difficulty using strategies to solve math problems. By observing and working directly with child over time, the teacher can determine if his/her difficulty learning mathematics is persistent. These children have weakness in academic skills which are to be thoroughly developed via make use of various types of individualized and effective intervention (Ahmad, 2018).

In Nigeria pupils with dyscalculia are in the same primary schools with those without disabilities. This is in line with the National Policy on Education (FRN, 3013) which has one of the aims as to provide access to education for all persons in inclusive settings. Dyscalculia is estimated to affect 3 – 6.5% of the world school population (Shalev, Manor & Tsur, 2007). Simply performing poorly in mathematics does no necessary mean that the student has dyscalculia.

Educational psychologists use a series of tests to determine whether a person has dyscalculia. An evaluation reveals how a person understands the user's numbers and mathematics concepts to solve everyday problems. The evaluation comprises of a person's expected and actual level of skills and understanding while noting specific strengths and weakness (Westwood, 2008).

Definition of Dyscalculia

Dyscalculia can be termed as a Specific Learning Disability, a term with a number of variations such as learning difference, a learning disorder, learning difficulty or learning disability. Sharma (1997) stated that dyscalculia is "an inability to conceptualize numbers, number relationships (arithmetical facts) and the outcome of numerical operations estimating the answer to numerical problems before actually calculating." Dyscalculia is also referred to various conditions that cause specific mathematics problem, for example developmental dyscalculia, mathematics disability, numeracy learning disability, and number fact disorders. Dyscalculia describes someone's ability to become proficient in numeracy (Emerson & Babtie, 2010). Dyscalculia is a specific difficulty conginental for calculation. It is a primer cognitive impairment during childhood that affects the children's intelligence to learn arithmetic concept, and arithmetic information (Pellerone, 2013).

Children with dyscalculia can achieve numeracy efficiency if they are taught appropriately using a structured multi-sensory method. Dyscalculia can coexist with other conditions such as dyslexia, dyspraxia, attention deficit disorder (ADD) and attention deficit hyperactive disorder (ADHD) (Emerson & Babtie, 2014).

Symptoms of children with Dyscalculia

These are some of the signs an individual might exhibit as:

1. Read and or writes numbers patterns inconsistently (e.g write 31 as 13, 6 as 9 reversed $3^1/_2$, $5^1/_2$. $7^1/_2$).
2. Has spatial/directionality problems (more-less, longer smaller ><, heavier-lighter).
3. Does not understand place value of digits
4. Cannot follow sequences in multi-step problems
5. Cannot solve story problems
6. Does not grasp concepts related to numbers

7. Confused with terms more-less after, before, yesterday today, tomorrow, 30 minutes 2 hours.
8. Says multiplication tables, but cannot use them correctly
9. Identify numbers 6 for 9, 36 for 63, 14 for 41 and so on.
10. Can confuse addition/subtraction on paper but cannot relate to a real situation as in shop.
11. Get confused with mathematical sign -, >, <, +, etc

Identification and Assessment of children with Dyscalculia

There are two key methods that one can use to identify Dyscalculia. These include qualitative and quantitative methods. Qualitative methods are provided under WHO, UK learning support services, and the Diagnostic Statistics Manual (DSM-IV). The qualitative methods used, on the other hand, can rely on one of the three categories of the model. These include the discrepancy model, severity model and the "resistance to treatment" model. According to the discrepancy model, there exists a significant inconsistency in a child's performance in arithmetic compared to the overall performance/ achievements. The severity model relies upon cut off points such as percentiles to determine the condition's level of severity. Lastly, the "resistance to treatment" is employed in scenarios where a child remains unresponsive to any implemented interventions and chooses to continue using immature arithmetic strategies rather than efficient ones. For example, the child might decide to go back to finger counting as they experience difficulties in remembering number bonds (Shalev & von Aster, 2008).

Early detection methods will also come a long way on helping to curb dyscalculia. For example, Mazeyanti & Mohammed (2020) record success when using the CheckDysc (a mobile game constructed to diagnose children with dyscalculia). Checkdyse evaluate in terms of its usability and effectiveness to assess the dyscalculia signs in children. The parents and teachers of such students, mainly those in pre-school, might be unaware that the student is Dyscalculia. However, the use of mobile game Apps such as CheckDysc provides an early detection system that can alert both parents and teachers, which will be prompted to institute the best remedial measures.

Most school district currently use a process called the discrepancy model to identify whether a child has a specific learning disability (LD), as defined by state regulations. In the discrepancy model, the school psychologist determines if there is a significant discrepancy between a child's potential (usually measured by an

intelligence, or IQ, test) and achievement (as measured by an achievement test). The current individual with disabilities education Act (IDEA 2004) legislation permits states and school district to use alternative procedure for identifying children with LD. The response – to intervention model looks at how a child responds to research based instruction over time. In this approach, mathematics instruction that is delivered in small groups and tailored for a child's progress noted.

This means that assessment of the student specific Arithmetic skill helps in the educational and instructional planning of the child's academic activities. Children with Learning disabilities also exhibit problems in acquiring mathematical concepts, skills and problems-solving strategies.

Information about students' abilities and proficiency in mathematics can be gathered through both formal and informal tests measures.

Formal Test

A formal assessments is a data-driven method of evaluating children's, usually with well-defined parameters. Formal assessments produce results that have significant effect on a learner's progress. Formal mathematics test include standardized survey test. Some are designed for group administration and some are individually administered as achievement tests. There are also diagnostic mathematics tests. It is important to check the validity, reliability, and standardization procedures of test before using them (Salvia & Ysseldyke, 1995).

Informal Measures

Informal measures offer an alternative way to obtain information about a student performance and abilities in mathematics (Voughn & Willson, 1994). Informal assessment can take place in any student teacher interaction. It has the potential to occur at any time and can involve whole class, small group or one-to-one interaction. It can arise out of any instruction/learning activity at hand (gathering), and it is embedded and strong linked to learning and teaching activities" (Bell & Cowie, 2001). To assess mathematics abilities, the following measures may be used:

a. The informal inventory: is an informal classroom assessment tools meant to spark conversations between teacher and learners through regarding the children's understanding, skills and attitudes. Using the scripted protocols and included manipulative, and Classroom Mathematics Inventory CMI aids

teachers in determining students' performance across the strands of mathematics (Andrea Guillaume)

b. The clinical interview: is a type of formative assessment that can be used by teachers to collect information on how a children thinking about a particular mathematical topic often referred to as a diagnostic interview. As defined by the Diagnostic and statistical Manual of Mental Disorders, (DSM-V); American Psychiatric Association (APA, 2013) and its precursor, the Diagnostic and statistical Manual of Mental Disorders, fourth edition, Text Revision (DMS-IV TR; American Psychiatric Association, 2000). Interview with parents and teachers are equally important in school-based behavioral assessment and problem solving consultation for behavioral and academic problems. Clinical interviews "involve intense interaction with the individual child, an extended dialog between child careful observation with the child's work with 'concrete' intellectual object and flexible questioning tailored to the individual child's distinctive characteristics" (Ginsburg, 1997). Unlike standardized assessment clinical interview are not concern of comparing students to their peers. Instead, the goal is to provide context in which a child can make his or her internal cognitive processes external so the interviewer can observe them through the child's problem solving processes or explanations (Ginsburg & Dolan, 2011). Clinical interview xcan be used to determine the nature of a children's mathematical thinking and the concepts the child is relying on to solve problems (Jacobs, Franke, Capenter, Levi, & Battery, 2007).

c. Analysis of mathematics errors: is a method used to identify the course of student errors when they make consistent mistakes. It is a process of reviewing a learne's work and then looking for patterns of misunderstanding. Errors in mathematics can be factual, procedural, or conceptual, and may occur for a number of reasons. Identification of students' specific errors is especially for students with learning disabilities and low performing children's. By pointing the children errors, the teacher can provide instruction targeted the children's area of need (Salvia & Ysseldyke, 2004).

d. Curriculum – based assessment: Curriculum Based Assessment (CBA) is an informal assessment of a learner's performance on class curriculum. CBAs are commonly designed by the classroom teacher and can refer to any assessment that compares a children's performance to a classroom's curricular standards or criteria. believes that all students who show problems in school can be helped by better teaching and that there is no need to perform the more

traditional clinical assessment that have become the standard fare for assessment in all cases. There are students who have handicaps that are all beyond the scope of regular classroom experience to handle, but there number is very low compared to the number of children that are being referred for special education consideration today. The rare student is truly handicapped in the traditional sense is unique-so much so that no generalize criteria apply. To assess the learning needs of such children requires the comparative skills of a number of different profession working together to determine the factors involved and how best to help a particular children.

Strategies for Mathematics Instruction

After carrying out assessment, it is imperative that remediation will follow immediately, because assessment of a child will determine the form of remediation to be used. Mathematics is an easy subject to teach. It involves an analysis of the topic to be taught and identifying child's firm ground (Emerson & Babtie, 2010). The main difficulty comes in carrying out an assessment of children with any learning disability. However, it should be noted that any remediation process should be proceded by careful assessment. For learning mathematics, a number of empirically-validated practices are available. In increasing intensity, four are presented here: (a) Task Analysis; (b) Explicit Instruction; (c) Multisensory Instruction, and (d) Field Dependent Approaches.

Task Analysis. Task analysis means to break a task down into small steps and sequentially prompt each step for students (Browder, Jimenez & Trela, 2011; Witzel & Riccomini, 2007). In mathematics, a task may be broken down such as long division into a series of steps. Children's should practice each step one or two at a time, rather than as the whole process at once. Practicing a stepwise process incrementally allows a child to succeed with minimal error.

Explicit Instruction: The cornerstone of explicit instruction is gradual release from teacher knowledge to student knowledge. Typically, explicit instruction begins with an introduction to set the purpose of the lesson followed by teacher modeling with clear think alouds, high amounts of interactivity through guided practice, and an abundance of independent practice. Explicit instruction has a high effect size for students with disabilities and at-risk concerns in both reading and mathematics (Gersten, Beckmann, Clarke, Foegen, Marsh & Witzel, 2008; 2009).

Multisensory Instruction: Teaching new content through multiple representations has long been supported for students with learning difficulties in

reading and mathematics. In mathematics, the equivalent to Multisensory Structured Language (MSL). MSL programs incorporate task analysis and explicit instruction but include auditory, visual and kinesthetic/tactile sensory input. In mathematics the equivalent to SML is Concrete Representational Abstract (CRA). In CRA, children learn mathematics through multiple representations, beginning with concrete manipulations followed by pictorial representations of those manipulations and ending with abstract practice (Witzel, 2016)..

Field Dependent Approaches: field-dependent approaches rely on progressive scaffolding of fully worked examples to help guide a student through a process of understanding. Field-dependent learning relies on a teacher's task analysis and guidance of stepwise progressions to show how to complete a problem (Browder, Jimenez, & Trela, 2012). In mathematics, the steps would initially be present for the children in a graphic organizer. Ghani, (2004) and Chu, (2007) have brought together findings of many studies and noted factors that influence the extent of degree of which a learner is either field-dependent or field independent. In mathematics, Al-Ehezi, (2008) found a strong correlation of extent of field dependency with performance in mathematics test. In deed she went further to show, using factors analytic techniques, how the field-dependency variable loaded on to the same factor as mathematics performance, causing her to ask, 'Is ability to select information from noise the same as skills in mathematics?.

The work of Piaget (1963) has established the learner as a person who is trying to make sense of what is experienced. In looking at 'making sense of problem is that this will often generate working memory overload and yet it is this dimension which is the natural way of learning and understanding.

Conclusion

Mathematics learning disability, mathematics difficulties or Developmental Dyscalculia, associated with persistent low achievement in mathematics are common and not attributable to intelligence, may arise because of different factors, ranging from poor teaching strategy, to behavioral attention problems. However, a subset of children with mathematics difficulties, possibly with the most-severe impairment, appears to suffer from a developmental learning disorder that undermines the ability to process basic numerical magnitude information, and that impairment in turn undermines the acquisition of school-level arithmetic skills. Teachers must be apprised of the children's who struggle

with numeracy skills. Without awareness, concerns and support may not lead to targeted instructional changes.

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