
The Effective Strategies for Reducing Learning Difficulties in Senior Secondary School Chemistry

^[1]Emendu, Nnamdi B. (PhD), ^[1]Ikeowu, Peter I. (PhD), and
^[2]Emendu, Ebele R.

^[1]Department of Chemistry, School of Sciences, Nwafor Orizu College of Education Nsugbe, Anambra State, Nigeria

^[2]Department of Geology, Nnamdi Azikiwe University Awka, Anambra State, Nigeria

Abstract. Learning is an act of acquiring knowledge or skill. For learning to be meaningful it has to follow the processes. A situation whereby the brain is struggling to settle with this process, the learner will have a problem and such problem is termed learning difficulty. Learning difficulties to student is one who exhibit problems in acquiring academic skills as a consequence of a range of cases. Causes of learning difficulties include genetic effect, brain development and environment effect. Types of learning difficulties include dyslexia, dysgraphia, dyscalculia, dyspraxia, auditory processing disorder and language processing disorder. Chemistry is a natural science associated with substances and their metabolites and applications. Learning of chemistry requires knowledge of signs, symbols, diagrams, vocabulary. Many students are finding it difficult to understand the content of chemistry, hence experiencing learning difficulty. The solution of these learning difficulties includes diagnosis, coping with the challenges, occupational therapy and counseling. With the use of appropriate strategies such as using appropriate languages, resources, ICT, and clear chemistry content the problem of learning difficulties will be reduced in schools. Some recommendations were made.

Key words: Strategy, Learning Difficulty, Chemistry

Introduction

Students in general are meant to learn from their teachers. At senior secondary schools in Nigeria the students are made to prepare for their way of living. Unfortunately, some students are not comfortable in school because of the problems they encounter. One of such problems is learning difficulties. The New International Webster's Comprehensive Dictionary of the English language, Encyclopedic Edition (2010) sees learning as an act of acquiring knowledge or skill. Farrant (1980) sees learning as the process by which we acquire and retain attitudes, knowledge, understanding, skills and capabilities that cannot be attributed to inherited behaviour patterns or physical growth. A learning difficulty can be described as an issue with the brain's ability to process information.

Learning difficulties are a group of disorders involving significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning or mathematical abilities. Learning difficulties may refer to students who exhibit problems acquiring academic skills as a consequence of a range of causes. These include: intellectual disability, physical or sensory deficits (e.g. hearing impairment), emotional or behavioural difficulties, and inadequate environmental experiences. Students may also display learning difficulties if they have not been provided with appropriate educational opportunities or have received ineffective instruction in the classroom. Individuals with a primary difficulty in maintaining attention and concentration are also likely to show weaknesses in academic achievement due to their difficulties in attending to the learning environment. Individuals who have a learning difficulty may not learn in the same way or as quickly as their peers, and they might find certain aspects of learning, such as the development of basic skills, to be challenging. Learning difficulty cannot be cured but can be reduced. Because learning difficulties cannot be cured, their effects

may impact an individual's performance throughout life such as in academics, in the workplace, in relationships and daily life intervention. Therefore, it is necessary to reduce the learning difficulties in these students. It requires effective strategies to achieve.

Learning difficulties affect the way the brain receives, processes, stores, and analyzes information. While some learning difficulties are mild others may have a severe impact on an individual's academic performance. However, behavioral teachings tailored specifically to the type of difficulty the learner has. That a child has a learning difficulty does not mean an individual will be unable to succeed academically or hold an intellectually demanding post on. In Nigeria, chemistry is introduced to the students in Senior Secondary School one (SS1) It involves a lot of learning processes such as terminology, signs, vocabulary, illustrations and symbols. According to Ikokwo (2019), one of the objectives of teaching chemistry is principally to produce competent knowledgeable and skilled personnel in chemistry who should be able to develop and apply functional knowledge of chemistry. Some students develop learning difficulty from birth or later in life.

Science in general and chemistry in particular has so much revolved the world that it has in fact become necessary part of living. Chemistry is known as the central science because it touches all other natural sciences, like biology, physics, geology and others. Chemistry is a physical science and it is the study of the properties and interactions between matter and energy.

Chemistry is one of the most important branches of science that is regarded as a difficult subject by the students (Sirhan, 2007). Chemistry teaching is supposed to be result oriented and students centered. This can only be achieved when the students are willing to learn and teachers are ready to teach. Many researchers have called for serious interventions into the series of problems encountered by students in learning (Nnoli & Okafor, 2007; Achimugu, 2017). Emendu (2014) had already discussed the role of chemistry education in National Development. Chemistry learning requires much intelligent thought because the content contains many abstract concepts which will help to link to other concepts. Unfortunately, some students cannot read, write and interpret some signs, symbol and illustrations in chemistry due to these learning difficulties. This resulted to poor knowledge of the chemistry concept, unable to solve calculations, poor communication skills, cannot sketch or label a diagram (Chief WASSCE Examiners Report, 2018). This paper seek to bring together the general findings from research based on the learning difficulties, the causes, strategies and solution to the problem by strategy we mean a plan of action designed to achieve a long term or overall aim.

Types of Learning

Learning chemistry requires all the domains in education which include:

1. Affective learning: This has to do with feelings and values and therefore influences the learners altitudes and personalities.
2. Cognitive learning: This is achieved by mental processes such as reasoning, remembering and recall. It helps in problem-solving, developing new ideas and evaluation.
3. Psychomotor learning: This has to do with the development of skills which require efficient co-ordination between our brains and memories, as when we read or write or carry out physical skills.

Students with learning difficulties require more psychomotor learning than other domains. Hence, the student of this nature requires practical activities.

Ways of Learning

There are two main ways of learning. These are:

1. Deductive learning: This describes the process by which a learner is presented with a hypothesis or general principle and applies a number of tests to it to discover whether it is true or not. It is more of teacher centered approach to education. In it concept and generalization

are introduced first to the learner followed by specific examples and activities to support learning. Lessons are generally being conducted in lecture form with minimal dialogue between the teacher and students.

2. Inductive learning: This is also known as discovery of which the learner rules by observing examples. Student with learning difficulty requires inductive learning more than deductive learning. This describes the process which is the reverse of deductive learning. In it the learner examines related matters to see whether any general conclusion can be drawn.

Causes of Learning Difficulties

These are:

1. Genetic effect: This may be from the gene. Once it is inherited it is there. It may be from father's or mother's side.

2. Brain development: Brain development before and after birth might have an impact on the development of learning difficulties. Children who were born prematurely, had a low birth weight, or who sustained a head injury may be more likely to have a learning difficulty.

3. Environmental effects: Environmental effects such as toxins, drugs, accident and poor nutrition in early childhood are also considered to be potential factors in the development of a learning difficulty. Poor foundation also contributes to learning difficulties. Farrant (1980) indicated that environment has an effect on learning; Umeoduagu (1998) indicated that where the teacher is communicating above the level of the learner and the learner is different in the requisite vocabulary, internalization of the desired concepts will become a greasy pole to climb. Umeoduagu (1998) emphasized that one serious development in our classrooms of today is the availability of learners to express themselves. In the opinion of Fafunwa (1990), if the language to communicate science is inaccessible to the learner, the little or no science concept development would take place.

Means of Communication in Chemistry

To reduce learning difficulties in chemistry, Olarwaju (1998) indicated the use of verbal, or non verbal communication or combination of the two.

1. Verbal: This covers the areas of spoken and written words. The learner needs to hear and understand the language. Verbal learning difficulties affect one's ability to read, write or otherwise process spoken or written words. Hassan (1991) indicated that the levels of comprehension of spoken and written English by our students are still a matter of concern to the educators. Hassan (1991) maintained that the language deficiency is one of the contributing factors to the poor performance of students during examination. The verbal strategy in chemistry involves the use of microphone, radio, television, computer and anything that produces sound.

2. Non-verbal: This is seen in the area of difficulty in:

a. the act of writing because the brain struggles to coordinate the many simultaneous tasks required (e.g. from moving their hand to form letter shapes to remembering the correct grammar acquired in a sentence);

b. processing what they see (e.g. having trouble making sense of visual details like signs such as “.” ‘ + ’, ‘ - ’ in chemistry);

c. understanding abstract concepts such as fractions.

Examples of non verbal communication include use of books, references, movement, attitude, documents, etc. The use of verbal and non verbal means of communication can be effective if it is properly utilized.

Types of Learning Difficulties

There are different types of learning difficulties. These include:

1. Dyslexia: Students with dyslexia may experience difficulties with any of the following:

- a. spelling and writing fluency;
- b. reading fluency and reading speed;
- c. short term working memory (this might affect recall when reading, following instructions retaining information short term);
- d. sequencing;
- e. processing usual information (experiencing print disturbance/glare). Dyslexics might occur along with other related conditions and is also known as a language-based learning disability.

2. Dysgraphia: An individual with dysgraphia might find it difficult to write legible space. Dysgraphia is a specific learning difficulty that affects writing, which requires a complex set of motor and information processing skills. It makes the act of writing difficult. It can lead to problems with spelling, poor handwriting, and putting thoughts on paper. Dysgraphia can be the result of visual – spatial difficulty (troubles processing with the eye sees). Or language processing difficulty (trades processing and matches hearing service of what the ear hears).

3. Dyscalculia: Its impact is on the ability to understand matters, concepts, or symbols. It is characterized by an act to understand simple number concepts and to master basic numbering skills. This includes learning number facts and procedures, telling the time, time keeping, indicating quantity, prices, money, and count. It deals with Mathematics.

4. Dyspraxia: This learning difficulty is centered on the ability to carry out sequences of co-ordinate motor activity, and the planning and execution of tasks. It is associated with problems of perception, language and thought. Verbal dyspraxia relates to difficulties in programming, sequencing and initiating the movements needed to make speech sounds and treatment is generally managed by a speech therapist. Motor dyspraxia affects the planning and execution of movements in a co-ordinate manner.

5. Auditory processing disorder (central auditory processing disorder). Individual with this condition may have difficulty recognizing the differences between sounds. For example understanding order of sounds. Recognizing where sounds have come from, or separating sounds from background noise.

6. Language processing disorder: This condition makes it difficult for individual to give meaning to sound groups in order to form words and sentences. It relates to the processing of both expressive and receptive and language.

Areas of Occurrence of Learning Difficulties in Chemistry

1. Accuracy: This learning difficulty is noticed in accurate and/or fluent word recognition and by poor spelling and decoding abilities. This is called dyslexia; Individuals with dyslexia experience difficulties with reading accuracy, rate and comprehension. They are also likely to struggle with phonological coding, or the ability to readily and easily associate speech sounds with individual letters and/or groups of letters, which is a central part of the reading process.

2. Written expression: The learning difficulty that is focused on the production of poor written language is called dysgraphia. Motor dysgraphia relates to persistent handwriting difficulties associated with impairment in motor co-ordination. Language-based dysgraphia is associated with difficulties in constructing meaningful and effectively structured written expression. These are students who have extreme difficulty getting their thoughts both in order and then down on paper. Many students with dysgraphia also have dyslexia.

3. Mathematics: The learner has concerns calculations. This is called dyscalculia. Also called dyscalculia this specific learning disability presents as a severe difficulty with number faculty and mathematical ability.

4. Co-ordination: This learning difficulty is centered on the ability to carry out sequences of co-ordinate motor activity, and the planning and execution of tasks. It is associated with problems of perception, language and thought. Verbal dyspraxia relates to difficulties in programming, sequencing and initiating the movements needed to make speech sounds.

5. Language: The learning difficulty occurs in vocabulary, word meaning or concept formation.

Solution for Reducing Learning Difficulties

1. Diagnosis: An individual with learning difficulties may find the diagnosis to cope with that person's family. The problem is when learning issues have been present for some time the person diagnosed may find the diagnosis to be a relief, especially when the diagnosis occurs later in life. Hence, once it is diagnosed the student may be afraid or ashamed of his/her self. Parents may worry that a learning difficulties will prevent their children from succeeding in school but this is not necessarily the case. Teachers, mental health professionals and specialized professionals are frequently able to work with student who has a learning difficulty or other academic concerns. These professional can help to identify particular areas of difficulty and develop specialized learning plans and strategies such as an individualized education program. In order to adjust learning and education strategies to best fit that student's strengths and accommodates for areas of weakness. When a child's needs cannot be adequately addressed in the original classroom a child may be placed in a different classroom for all or part of the school day – to receive specialized instruction often on an individual level.

2. Difficulty in coping with the challenges: Students may experience anger, frustration, anxiety, or stress as a result of the difficulty. They may become frustrated when they study extensively but receive low test scores; experience anger and stress when it is difficult to understand an assignment or become anxious at the beginning of each new school year. These emotional issues can often compound the issue and may worsen it but speaking about these and other emotional concerns to a counselor or therapist can be helpful. A therapist can also help individuals understand that although learning disabilities are lifetime, but many methods of help and support are available.

3. Educational opportunities: This involve the use of therapy such educational therapy, speech therapy even solution focused therapy. Educational therapists work with school aged individuals to improve skills in reading, writing and math. Speech therapist work with children who have language-based or reading comprehension issue can help them improve their ability to understand and communicate in social situations. Solution focused therapy may be appropriate for older children in higher classes. Student may do well in therapy groups, support groups or play therapy

4. Counseling: This can be helpful when those with a learning difficulty feel shy. Anxious or otherwise find it challenging to express themselves to others. Because emotional distress can be occur as a result talking through these anxieties in therapy may prove beneficial

Strategies to Reduce Learning Difficulty

1. Good learning environment: Hazards in the learning environment should be removed. Board must be clean and good, classroom lighting and ventilations should be appropriate. Roof, floor, wall, and windows of the classroom must be conducive for learning. Sitting arrangements should be adequate. Chemistry teachers should try to prepare the lesson very well before entering the class. These will be done in their mode of dressing, conduct, speech, and approach to issues.

2. The use of appropriate language: Language is one of the vital instruments used to reduce learning difficulty. The language employed in the learning process determines to a good extent how effective the learner will learn. If there is a wide gap between the teacher and student in language communicating, learning is hampered. Every subject has its own language. Adeyegbe (1998) had emphasized the importance of signs, symbols and formulae in communicating and understanding of chemical concepts. He indicated that most communication are through signs and symbols. Some educators have called for mother-tongue science teaching (Akale, 1991; Madu, 1991; Olawuyi, 1991; Ajikobi & Beilo, 1991; Hassan, 1991). Even Inoniesa (1991) study confirmed that you can teach chemistry in the mother tongue. A language of chemistry is a language that borrowed words, signs, and symbols from the majority of languages in our environment.

3. Additional time: Students with learning difficulty requires additional time to learn. They find it difficult to understand, assimilate information. While they are slow learners they need more time to absorb what is being taught.

4. The use of resources: The use of necessary resources in teaching and learning will help to reduce the learning difficulty. Resources appeal to the different senses through which learning takes places. Chemistry teachers should employ a handsome Variety of resources in teaching especially those students that have learning difficulty. The resources must not be limited to the conventional ones in the chemistry laboratory, workshops, or resource centers. Some of natural resources exist in the immediate environment and in the community. Sometimes the learner are familiar with the resources, teachers should direct the students toward the resources hence the teacher is just a guard.

5. Use of Information Technology Communication (ICT): This is computer era. We need computer literate teachers and students. To make this materialize in our present day classrooms, adequate computers should be supplied in schools. The chemistry teachers will be well familiar with the use of the computer. The students mastering the use of computer will reduce the learning difficulties.

6. Nature of chemistry content: Some teachers are not communicating the content well because the content is difficult to them. Because the teacher find the content difficult to teach, the students find the content difficult to learn. The teacher should therefore apply many strategies to teach for effective learning. The teacher should make the content learner friendly.

7. Use of teaching aids: Chemistry is a practical course. Chemistry teacher should make use of a simple or local material in teaching. The teaching aids will be within their reach of the students. If the teaching aids are made attractive, the learner shall become more interested, thereby removing any other psychological factor in the learning process.

8 Use of incentives: Both the teacher and students need incentives in the teaching and learning process. Teachers should be given a good accommodation, allowances, sending for in-service training and any other incentives they needed. The student will be given allowances, good boarding facilities should be provided.

Conclusion

In a normal setting, the learning suppose to flow especially in a situation the learner is healthy and in a very conducive environment as well as with the necessary resources. The causes of learning difficulties include, genetic factor. Brain development and environmental factors: The strategies to reduce the learning difficulty include use of appropriate language, resource, ICT, equipment and nature of chemistry content. These is a great need to look into the learning difficulties in chemistry as this may have contributed to the poor performance of students in chemistry in all the senior secondary school certificate examination in Nigeria.

Recommendation

The following recommendations are suggested.

1. Teachers should attend conferences, workshops and seminar to improve on their teaching strategies.
2. Schools will provide more time and space for the students with learning difficulties.
3. Policy makers will consider the student with learning difficulties.

References

- Achimugu, C. (2017). Parents' Perception of the Principals' and Chemistry Teacher Instructional Efficiency in Secondary Schools in Idah Local Government Area. Kogi State. *60th STAN Anniversary Conference proceedings*, 259-206.
- Adeyegbe, S. O. (1998). The importance of signs, symbols and formulae in communication and understanding of chemical concepts. *39th STAN Annual Conference Proceedings*, 1622-166.
- Ajikobi, S.O. & Belt G. (1991). Nigerian societal beliefs and language effects on the teaching and learning processes in science. *STAN 32nd Annual conference proceedings*, 33-36.
- Akale, M.A.G. (1991). A close examination of the use of mother-tongue as medium of instruction in science. Technology and Mathematics (STAN) in Nigeria schools. *STAN 32nd Annual Conference proceedings*, 15-20.
- Emendu, N. B. (2014). The role of chemistry education in national development. *The International Journal of Engineering and Science*, 3(3), 12-17.
- Fafunwa, A. B. (1990). New Directions for Science, Technology and Mathematics Education for the 90's. *Keynote Address at the STAN 31st Annual Conference of STAN*, University of Benin, Benue city, 21st August – 1st September.
- Farrant, J. S. (191). *Principles and Practices of Education*. London: Morrison and Gibbs.
- Hassan, L. C. (1991). Teaching of science, technology and mathematics in the mother tongue: problems and project. *STAN 32nd Annual conference proceedings*, 37-40.
- Ikokwo, P.I.I. (2019). Underlining issues in optimizing creativity among chemistry education students. *South Eastern Journal of Research and Sustainable Development*, 2(2), 42-60.
- Innomiesa, E.A. (1991). Teaching chemistry in the mother tongue: Perception of teachers and students. *STAN 32nd Annual conference proceedings*, 255-258.
- Nnoli, J. N. & Okafor, C.U.C. (2017). Enhancing students' academic achievement and retention of knowledge through the use of chemistry instructional materials: Implication for stemdication in our society. *60th STAN Anniversary Conference proceeding*, 267-272.
- Olarwaju, A. O. (1998). Students perception of the efficacy of Yoruba and English languages as media of communicating science in the classroom. *STAN 39th Annual Conference Proceedings*, 36-42.
- Olawuyi, A.O. (1991). Teaching primary science in mother tongue: A vocabulary problem consideration. *STAN 32nd Annual conference proceedings*, 27-32.
- The New International Webster's comprehensive dictionary of the English language Encyclopedia Edition (2010). U.S.A: Typhnon Media Comporation.
- Umeoduagu, J.N. (1998). Learner-friendly communication strategies for effective STAN teaching. *STAN 39th Annual Conference Proceedings*, 17-20.