

Individualized Instruction: Chemistry Teachers Extent of Its Utilization and Challenges in Teaching in Secondary Schools in Anambra State, Nigeria

Dr Evelyn Obianuju Egolum, Onuigwe Blessing Ukamaka

Department of Science Education, Nnamdi Azikiwe University, Awka

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ABSTRACT

The study investigated Chemistry teachers' extent of utilization of individualized instruction and challenges they face in using it in teaching and learning in secondary schools in Awka and Aguata Education Zones of Anambra State. The study was guided by four research questions. The design for the study was a descriptive survey design. The population for the study consisted of all the Chemistry teachers in the 110 public secondary schools in the two zones. The sample consisted of 80 Chemistry teachers selected by purposive sampling from 36 (20 schools from Awka education zone that has a total of 61 schools and 16 schools from Aguata education zone that has a total of 49 schools) secondary schools in the two education zones used for the study. The instrument used for data collection was a validated 31-items questionnaire constructed by the researchers. The reliability of the instrument was estimated using Cronbach Alpha technique and the reliability coefficient was 0.77. The data were analyzed using mean and standard deviation. The findings revealed among others that different types of individualized instruction includes small group instruction, programmed instruction, self-directed learning and so on and the Chemistry teachers utilize individualized instruction to a moderate extent in their teaching. The challenges they encounter while using individualized instruction includes lack of knowledge, skills and competencies in using it, lack of enough time to plan and implement it among others. The researchers recommended that Chemistry teachers should go for training and re-training programmes to update their knowledge, skills and competencies in the use of individualized instruction and other innovative strategies in teaching and learning.

Key words: Chemistry Teachers, Individualized Instruction, Utilization, Teaching and Learning

INTRODUCTION

Chemistry is a branch of science that deals with the study of our environment and explains things that are happening in the environment. Chemistry as a building block for a range of science disciplines has the potential to link other sciences together and foster greater scientific literacy (Tera, 2018). Chemistry is a prerequisite for further studying of a number of sciences related professional courses such as medicine, pharmacy, nursing, food technology, chemical engineering, agriculture and so on (Egolum & Okonkwo, 2022). Chemistry offers a lot of usefulness and importance to humanity in the production of materials such as textiles, processed foods, beverages, wine, soap, cosmetics, fertilizer, insecticides and numerous others. It also develops and acquaints learners with acquisition of skills and competences necessary for self-reliance (Egolum, 2013). In spite of all these importance and position chemistry occupies as a fulcrum on which all other sciences hinge on for industrial and national development, there has been fluctuations in student's performance in it with little or no improvement over the years (Waec Chief Examiners report, 2017-2022). These observed persistence students fluctuations in performance in chemistry could adversely affect the realization of the national goals for scientific and technological development.

Research studies have shown that several factors contribute to this ugly trend. Such factors include lack of qualified chemistry teachers, overloaded curriculum (Egolum & Onuigwe, 2023); lack of instructional materials, difficult nature of many chemistry concepts, ill equipped laboratories, lack of interest among chemistry students (Ngozi-Olehi *et al*, 2018) and Poor teaching methods employed by the teachers (Egolum,

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Samuel & Okonkwo 2021)). The major aim of teaching and learning process is to upgrade learner's knowledge and each learner is unique in his or her own way (Anijah, 2023). Therefore individual differences cannot be neglected in any stage of human learning. Teachers should design learning activities that can better address the individual needs of students. To achieve this, researchers in Nigeria have continued to seek better ways teachers can use in teaching chemistry in order to maximize meaningful learning. This is because the teacher and teaching strategies adopted are the most pronounced and important factor that generally influence students' performance (Asiyai, 2005; Egolum *et,al*, 2022). The Chemistry teachers should de-emphasize the use of teacher-centered traditional chalk-talk-approaches of teaching and should embrace more innovative student-centered and activity based approaches which have been reported to be effective in realizing the objectives of chemistry education. These innovative, student-centered and activity based instructional strategies can be approached in form of individualized instruction where students engage in activities of learning on individual basis.

Individualized Instruction is an individual based, student paced strategy to mastery of instruction where students typically learn independent of their classmates (Dawal, 2021). It is a teaching method employed to meet individual differences. Mang & Mankilik 2015 envisaged individualized instruction as a situation where the student gets primary control over what he/she studies for how long, where, when and with whom. Individualized instruction is an educational approach that recognizes the uniqueness of each learner and seeks to adapt teaching methods, materials and pace to match their individual needs (Mims, 2023). It is a system where teaching and learning activities are organized to take into account the individual interest and needs as well as the learning speed and capabilities of the students (Mansaio et al (2002). Individualized instruction is the effort on the part of a school to organize the learning environment to take into account individual students characteristics and needs. Key components of individualized instruction are Personalization, Differentiation and Flexibility. Personalization deals with clearly understanding each student's profile, strengths, weaknesses, interest, goals and learning styles. Differentiation deals with using various strategies to tailor instruction to meet each student's needs and this can include offering resources, varying levels of complexity or adjusting the time of instruction. Flexibility deals with allowing students to progress at their own pace, explaining topics of interest and delving deeper into areas where they need extra support (Mims, 2023).

Individualized instruction has the following advantages: It addresses with specific support the students strengths and concerns; It makes sure that pacing and workload given to students match their ability; It ensures that students have more ownership in their learning and that engagement and motivation are high when students feel connected to their progress and success. Chemistry classrooms contain substantial numbers of students with diverse learning needs and many of these students display characteristics resulting from such factors as language, intellectual cognitive abilities, behavior, culture or limited exponential backgrounds that can significantly interfere with successful learning (Pattan in Ruhan, 2010). Individualized instruction represents comprehensive attempts to improve learning by tailoring instruction to these individual characteristics. It is based on the assumption that students differ in aptitude, learning rate, culture and motivation as well as other variables. Individualized instruction enables learners to take control of their learning and by working independently; learners develop self-directed learning skills which are essential for life-long learning (Kuo, 2018). Individualized learning allows each child to move at their own pace and with the right support, closes learning gaps by identifying where the child is struggling and addresses any weakness that they may have. For individualized instruction to be effective there should be set individual instruction goals and plan. Having stated goal according to Nguyen (2015) is essential for learning as it helps them comprehend and support the learning content not only in the process of learning but also in the final performance. When learners implement it correctly and effectively, goal setting becomes the potential to positively long term influence on their learning (Tranet, 2021).

Each student has a unique learning style therefore instruction does not suppose to be one size-fits-all but rather should adapt to individual needs. It is the teacher that must deal with the challenges of accessing the needs of each student in his/her class and there are different types of individualized instruction that can take care of students needs. Therefore the researchers investigated the extent teachers utilize individualized instruction in the teaching and learning of Chemistry in secondary schools

Purpose of the Study

The main purpose of this study was to investigate the extent of utilization of individualized instruction in teaching and learning of chemistry in secondary schools in Awka and Aguata Education Zones of Anambra state. Specifically the study sought to

1. Identify the different types of individualized instruction used by teachers in teaching and learning of Chemistry in secondary schools in Awka and Aguata Education Zones of Anambra state.
2. Determine the extent of utilization of individualized instruction in teaching and learning of Chemistry by teachers in secondary schools in Awka and Aguata Education Zones of Anambra state.
3. Ascertain the challenges encountered by chemistry teachers in the use of individualized instruction in teaching in Awka and Aguata Education Zones of Anambra state.
4. Ascertain the strategies that will help chemistry teachers individualize their instructions effectively

Research Questions

The following research questions guided the study

1. What are the different types of individualized instructions used by teachers in teaching and learning of Chemistry in secondary schools in Awka and Aguata Education Zones of Anambra state?
2. To what extent do Chemistry teachers in secondary schools in Awka and Aguata Education Zones of Anambra state utilize individualized instruction in their teaching?
3. What are the challenges encountered in the use of individualized instruction by Chemistry teachers in secondary schools in Awka and Aguata Education Zones of Anambra state?
4. What are the strategies that will help Chemistry teachers individualize their instructions effectively?

Research Method

The design adopted for this study was a descriptive survey design. The population for the study comprised all the chemistry teachers in the 110 public secondary schools in Awka and Aguata education zones of Anambra State. 20 schools were selected from Awka Education Zone that has 61 public secondary schools while 16 schools were selected from Aguata Education Zone that has 49 public secondary schools. The sample size was 80 Chemistry teachers selected by purposive sampling from the 36 public secondary schools that have at least two Chemistry teachers from Awka and Aguata Education Zones of Anambra state

The instrument used for data collection was a structured questionnaire constructed by the researchers. The instrument has 31-items and was titled “Extent of Utilization of Individualized Instruction by Chemistry Teachers in Anambra State”. The questionnaire has two parts- “A and B”. Part A contained information on the biodata of the respondents while part B had four sections. Sections 1, 3 and 4 were structured on a four-point Likert scale of Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point. Section 2 was built on a four-point Likert scale of Very High Extent (VHE) = 4 points, High Extent (HE) = 3 points, Moderate Extent (ME) = 2 points and Low Extent (LE) = 1 point.

The instrument was face and content validated by one expert in measurement and evaluation and two experts in science education and their corrections were incorporated into the final draft of the instrument before it was administered to the respondents. The instrument was trial tested on twenty Chemistry teachers from Onitsha and Ogidi Education Zones who were not part of the study but had all the qualities of the population of the study. A reliability coefficient of 0.77 was estimated using Cronbach Alpha technique.

Two research assistants helped the researchers to administer the questionnaire to all the Chemistry teachers in the 36 public secondary schools used for the study. Out of the 83 questionnaires shared to the respondents, 80 was returned and used for data analysis. The data collected were analyzed using mean and standard deviation. A mean of 2.50 and above was accepted by the respondents while a mean of less than 2.50 was regarded as not accepted by the respondents

RESULTS

Results of the study were presented in tables according to the research questions

Table 1: Mean scores and Standard Deviations (SD) of Chemistry teachers on the different types of individualized instruction used in teaching and learning of chemistry

S/N	TYPES OF INDIVIDUALIZED INSTRUCTION	MEAN	SD	DECISION
1.	Small Group Instruction	3.23	0.63	Accepted
2.	Programmed Instruction	2.92	0.69	Accepted
3.	Self-Directed Learning	3.00	0.76	Accepted
4.	Use of Peer Tutoring	3.23	0.63	Accepted
5.	Problem-Based Learning	2.88	0.82	Accepted
6.	Computer-Assisted Instruction	2.73	0.75	Accepted
7.	Individual Project Work	2.96	0.88	Accepted
8.	Resource Based Learning	2.89	0.71	Accepted
	Grand Mean	2.98		

The result on table 1 shows that all the chemistry teachers used for the study accepted that all the items on the table were among the different types of individualized instruction that can be used to teach chemistry in secondary schools hence all have mean scores of above 2.50

Table 2: Mean scores and Standard Deviations (SD) of chemistry teachers on their extent of utilization of individualized instruction in their teaching

S/N	ITEMS	MEAN	SD	DECISION
1.	Small Group Instruction	2.95	0.74	Moderate Extent
2.	Programmed Instruction	2.21	0.88	Moderate Extent
3.	Self- Directed Learning	2.90	0.80	Moderate Extent
4.	Use of Peer Tutoring	1.90	0.92	Low Extent
5.	Problem-Based Learning	2.13	0.62	Moderate Extent
6.	Computer-Assisted Instruction	2.45	0.92	Moderate Extent
7.	Individualized Project Work	3.01	0.81	High Extent

8.	Resource-Based Learning	2.99	0.94	Moderate Extent
	Grand mean	2.57		Moderate Extent

Table 2 revealed that the Chemistry teachers used for the study agreed that they use items 1, 2, 3, 5, 6 and 8 were among the types of individualized instruction they use to a moderate extent, they use item 4 to a low extent while they use item 7 to a high extent. However none of those teachers use any of those individualized instruction type to a very high extent

Table 3: Mean scores and Standard Deviation (SD) on the challenges encountered by chemistry teachers in using individualized instruction in teaching

S/N	ITEMS	MEAN	SD	DECISION
1.	Lack of enough time on the timetable to implement individualized instruction	3.06	0.40	Accepted
2.	Lack of knowledge, skills and competency to use individualized instruction	2.85	0.75	Accepted
3.	Lack of confidence and motivation to implement it	2.55	0.78	Accepted
4.	Lack of adequate teaching aids for its implementation	2.62	0.84	Accepted
5.	Lack of support from school administrators on its funding	2.64	0.75	Accepted
6.	Lack of cooperation from other stake holders	2.95	0.74	Accepted
7.	Lack of enough professional development programmes to train teachers on how to use it effectively	2.82	0.78	Accepted
	Grand mean	2.78		Accepted

Findings on table 3 revealed that all the items on the table were among the challenges encountered by Chemistry teachers used for the study in using individualized instruction in their teaching hence all the items had mean above 2.50

Table 4: Mean scores and Standard Deviation (SD) of chemistry teachers on the strategies that will help them individualize their instructions effectively

S/N	ITEMS	MEAN	SD	DECISION
1.	Teachers should get to know their students strengths, interest and weaknesses	3.08	0.88	Accepted
2.	Provide reciprocal teaching opportunities	2.96	0.73	Accepted
3.	Offer problem-based learning	3.16	0.99	Accepted
4.	Utilize peer tutoring	2.84	0.83	Accepted
5.	Consider the amount of time given to questions and assignments	2.75	0.88	Accepted

6.	Involve students with cooperative learning	3.04	0.62	Accepted
7.	Plan hands-on- activities	3.38	0.64	Accepted
8.	Plan inquiry-based lessons	3.10	0.66	Accepted
9.	Involve students in project- based learning	3.21	0.73	Accepted
10.	Provide reciprocal teaching opportunities	2.95	0.72	Accepted
	Grand Mean	3.05		Accepted

Results on table 4 showed that all the chemistry teachers used for the study agreed that all the items on the table were among the strategies that will help chemistry teachers individualize instruction for their students

DISCUSSION OF FINDINGS

Table 1 revealed that the different types of individualized instruction used in teaching and learning chemistry were small group instruction, programmed instruction, self directed learning, use of peer tutoring, problem-based instruction and so on. Hence all the items on the table had mean scores of above 2.50. The findings is in agreement with the study of Malinovic et,al (2018) that types of individualized instruction most mentioned includes programmed instruction, problem-based instruction, computer-assisted instruction etc. Also the findings of the study are in agreement with that of Switzer (2004) who also reported that types of individualized instruction include programmed instruction, use of worksheets, problem-based instruction and so on. Folorunso et al (2020) reported that chemistry teachers are knowledgeable about the various types of individualized instruction that can be used in teaching and learning. This is justified from the fact that most chemistry teachers usually undergo different professional development to stay up-to-date with the latest teaching strategies and techniques. That professional development can be in form of attending workshops, conferences, reading professional journals and participating in online courses.

The findings on table 2 revealed that Chemistry teachers used for the study utilize individualized instruction to a moderate extent in their teaching hence their grand mean was 2.57. They use mostly small group instruction, self-directed learning, programmed instruction and so on to a moderate extent. They use only individualized project work to a high extent and use peer tutoring to a low extent. This is in agreement with the findings of Folorunso et al (2020) that chemistry teachers rarely use some types of individualized instruction in their teaching. This might be due to the fact that it requires more time to plan and implement because most of our schools have large class size and this makes it difficult for the teachers to practice. Also lack of resources and too many topics in the chemistry curriculum can also make it difficult for the teacher to use individualize instruction in teaching.

The findings of the study also revealed that the challenges encountered by chemistry teachers in using individualized instruction in teaching includes lack of skills, knowledge and competences in using individualized instruction; lack of enough teaching aids; lack of enough time to implement it among others. This is in agreement with the findings of Rashid and Wong (2023), Akcin (2022) and Baglama *et al* (2019) who all opined that lack of knowledge, skills and competencies; lack of motivation; lack of adequate teaching aids among others were among the challenges to effective implementation of individualized instruction. This might be because individualized instruction requires more time to plan and implement which can be challenging to teachers who are struggling to cover the contents in their chemistry curriculum.

The findings of the study also revealed that knowing the students strengths, interests and weaknesses; providing reciprocal teaching opportunities; offering problem-based learning; utilizing peer tutoring; providing enough teaching aids among others were among the strategies that will help teachers individualize their instruction. This is in agreement with the study of Olewe-Ngunya *et al* (2020) who found out that teachers needs adequate teaching aids and enough time in the timetable to help them individualize instructions. Also Mims (2023) opined that understanding students learning profile, their strengths, interests, goals and

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weaknesses among others were among the strategies that will help teachers individualize their instructions effectively.

CONCLUSION

Chemistry teachers used for the study do not use most of the different types of individualized instruction to a high extent in teaching; it might be because individualized instruction requires more time to plan and implement which can be challenging to teachers who has lots of contents in the chemistry curriculum to cover. Some students may not be ready or willing to work independently and teachers may struggle to assess students learning when students are working independently. Because of the numerous benefits of individualized instruction, chemistry teachers should embrace it because it helps to increase student's engagement, improve their academic achievement, enhance social skills, improve teacher performance and thus makes chemistry teaching and learning interesting, lively and relevant.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made

1. Chemistry teachers should be encouraged to go for training and re-training programmes to update their knowledge on the use of individualized instruction for effective lesson delivery
2. Workshops should be organized for chemistry teachers on effective classroommanagement so that they can effectively implement small group instruction. This will enable them know how to engage other students in the classroom while working with a small group of 2-6 students
3. There should be double periods on chemistry timetable to ensure enough time for teachers use of individualized instruction in teaching.
4. Teachers should use differentiated instruction and have a variety of learning stations that challenge and engage other students in rigorous activities.
5. Anecdotal notes should be used to track students' progress and instructional adjustments must be made on a weekly basis to ensure that students are in learning content skills.
6. The government and school administrators should provide enough teaching aids and resources for effective implementation of individualized instruction

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