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Comparative Evaluation of the 12th Grade Chemistry Curriculum According to The CIPP Evaluation Model "Türkiye and Nigeria"

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Abstract

This study aims to evaluate and compare the 12th-grade chemistry curriculum applied in high schools in Nigeria and Türkiye according to the CIPP evaluation model. mixed method was used in this study. The five-Likert scale Google form questionnaire prepared by the researcher in English and Turkish language was randomly applied in the high schools across Nigeria and Türkiye through mail, social media and other means of communication. In Nigeria, 203 whiles, in Türkiye, 162 of the 12th-grade chemistry teachers participated in the quantitative part of this study. In the qualitative part of the study, semi-structured interview questions which were prepared in English and Turkish were used to collect the opinions of participants across both countries. In Nigeria, five chemistry teachers participated in the study, while in Türkiye, three 12th-grade chemistry teachers participated. The collected quantitative data from the Google form were transferred to the SPPS data analysis software and analyzed. The data collected through semi-structured interviews were analyzed using descriptive analysis by transcribing the respondents' quotations. According to the findings of this study, both countries have similar aims and objectives for the 12th-grade chemistry curriculum. However, it was revealed that there is a difference between the two countries in terms of reaching the general goals of the curriculum. It was revealed that, in Nigeria, the educational system does not allow teachers to implement the curriculum effectively. The theoretical information in the chemistry textbooks was found to be sufficient in Nigeria while insufficient in Türkiye. It was found that in Nigeria, the language used in chemistry textbooks is difficult and complex, while in Türkiye, there are insufficient laboratories in the schools, which negatively affects the implementation of the chemistry curriculum. In the product and process dimensions, it was found that there are no significant differences between the two countries. It was recommended that chemistry curriculums in both countries should be reviewed and updated every year to fit in the new age of science and technology. Laboratories should be available in all schools in Türkiye, while in Nigeria, simple language should be used in preparing chemistry curriculums.

Keywords: CIPP model, Chemistry Curriculum, Nigeria, Türkiye

1. Introduction

Nature is man's habitat, and man is part of nature. People's lives, living conditions, and well-being depend on nature, so it is essential to understand how nature works; for this reason, the need for chemistry in science and technology for both human and national development cannot be over-emphasized, as knowledge and skills in science and technology are very important for the development of any country or society. Science and technology have become such critical economic and social development factors that life without them can no longer be contemplated [1]. The fast-changing applications of science and technology and the global reliance on its processes and products in all areas of human endeavor have made them invaluable for any society or country [2]. Considering the need for chemistry in both science and technology, it is necessary to evaluate the entire high school chemistry to examine both the teachers' and students' perceptions of the curriculum, which will help achieve the specific aims and goals of the chemistry curriculum. For this purpose, many studies have been conducted to evaluate the curriculum and to assess the chemistry curriculums' quality, standard and effectiveness at all levels of science classes. Brown (1989) has underlined the need to evaluate the curriculum, stating that other elements become meaningless without evaluation. In addition to the fact that, through science and technology, a nation develops its workforce in such critical areas as agriculture, engineering, architecture, medicine, and other science-based professions and technologies, the benefits of chemistry have pivoted every conceivable sphere of human life. The necessity of new drugs, vaccines, sophisticated equipment, and other tools that have been produced is helping in the diagnosis and treatment of various diseases, thereby enhancing human lives [1]. As a result of these benefits that accrue from the pursuit of science, especially chemistry, many countries have been

making gigantic efforts towards their development to keep pace with the rest of the world. The teaching of 12th-grade chemistry is based on the chemical laws of real life. During the course, the student learns to apply the knowledge in practice. Technology's rapid development means that children sometimes learn to use a computer from an early age. This leads to the problem that teachers encounter in teaching different subjects in 12th-grade classes. The Internet takes considerable time for students [3]. Unfortunately, this is all reflected in the ratings. Teachers need to consider the rapid developments in today's world (need to stay up to date). It would be better if teachers tried to "adapt" to technological change rather than deny it. Adding IT technology to the learning process will help students become interested in studying.

The purpose of teaching chemistry is to support the development of students' scientific thinking and a modern worldview as part of a diverse general education in Türkiyeand Nigeria. Teaching conveys the image of chemistry subject as one of the critical basic sciences that researches and develops materials, methods, products, and processes to promote sustainable development. Teaching helps to understand everyday life, nature and technology, and the importance of chemistry for the well-being of man and nature by studying substances, their structures and properties, and the reactions between substances. The teaching of chemistry is characterized by experimental observation as well as the study of properties of chemical phenomena and implications, the interpretation and elucidation of phenomena using models and structures, the explanation of phenomena in the sign language of chemistry, and the modelling and mathematical processing of phenomena [4]. Students are guided to develop all aspects of chemistry knowledge skills, including personality, through various work and assessment methods. The implementation of chemistry teaching considers the students' study abilities and creates a positive image of chemistry and its study.

2. Problem Statement

Evaluation is at the heart of all advances, whether discussing educational quality or school efficiency. Everywhere, policymakers and researchers stress the need for evaluation in quality control, quality monitoring, quality assurance, and quality improvement. Many countries place a greater emphasis on pupils and teachers than on schools when evaluating them. Education quality evaluation entails assessing every component of education, including its impact on students, and it is considered the first step toward quality improvement and development. Establishing whether or not objectives have been achieved is known as evaluation. It is related not only to the evaluation of accomplishments but also to enhancements. There are two ways to do this. Formative and summative evaluations are the two different types of evaluations available. Formative evaluation is data used to improve instruction, projects, and processes, ensuring that all components of a curriculum or project are likely to be successful. It is carried out to maintain track of instructional procedures and student development to provide constant feedback that pinpoints learning mistakes. Summative evaluation verifies that all required steps have been completed and objectives have been met. When an evaluation activity is carried out, both summative and formative evaluations are carried out (Aziz, Mahmood, & Rehman 2018).

The goal of an evaluation is to decide the worth or significance of an intervention. It is critical to have clear and explicit findings reporting that includes all the essential details about the outcome and the process. A medical education-specific adaption of the SQUIRE guideline (Standards for Quality Improvement Reporting Excellence) is being created. However, the existing guideline covers the essentials and can serve as a template for presenting evaluation findings. The gathering and analysis of data must be meticulous. This necessitates strict adherence to 'best practice' criteria for quantitative and qualitative research approaches. One of the most common criticisms of evaluation is that the results are limited to a given setting. It indicates that the likelihood of generalization or transferability to other situations is low. A similar argument can be made for single-site or single-cohort research studies. A case study provides an affluent and detailed explanation of a case, including context, methods, and outcomes, which is a strength of any high-quality evaluation in Türkiye and Nigeria. However, if numerous case studies from various contexts are synthesized or if a single case study turns to 'instrumental,' tying the findings to the more extensive literature or an underlying theory, the results of a single case study may have broader application [5].

Education stakeholders and scholars globally highlighted the importance of school evaluation, which aids in quality control, monitoring, assurance, and development. Furthermore, the school assessment is the central task based on different purposes, including administrative, methodological, and managerial improvements. Many evaluation types of research have focused on students and teachers rather than schools. However, quality evaluation of schools involves assessing all the aspects of the school and its impact on students, so it is the first step towards quality improvement and development [6]. One of the studies regarding chemistry as a subject by Yilmaz in his master's thesis titled "A general evaluation of science teaching in Türkiye" emphasised the change in the aims of science from the Ottomans to 1990 and the reflection of these changes on school curricula and as well the reflection of changes on the school curriculums [7]. In his study, pointed out the problems encountered during the development of science teaching in high schools and necessary suggestions were also made for the solution to these problems [8].

Therefore, it is essential to conduct comparative studies to reveal the similarities and differences in chemistry curriculums between the countries and to predict where the implementation of chemistry curriculums in these two countries can progress. In this study, the chemistry curriculums in Türkiye and Nigeria will be compared at high/secondary school levels, and the differences between the opinions of the teachers involved in the implementation between the two countries will be revealed. Another critical point why such a study is crucial and needed is that the aim and objective of the chemistry curriculums of these two countries have similarities in

one way or another. For these reasons, the comparative evaluation of this present study would fill a gap in clarifying the similarities and differences in chemistry curriculums in both countries. From this point of view, such a study is needed. However, the primary purpose of the research is as stated below.

3. Purpose of The Research

This research aims to evaluate and compare the implementation of the 12th-grade chemistry curriculum in different high schools in Türkiye and Nigeria. This comparative evaluation research is based on Stufflebeam's context, input, process, and product of the evaluation model, known as the CIPP model. In this context, 12th-grade chemistry teachers' opinions will be considered. For this reason, the research aims to evaluate and compare the following sub-objectives.

The following were the specific objectives of the study:

• What are the opinions of the 12th-grade chemistry teachers' opinions regarding the ***context, input, process, and product*** dimension of the 12th-grade chemistry curriculum?

• Comparison of the general objectives of the 12th-grade chemistry curriculum based on the teacher's views on the implemented 12th-grade chemistry curriculum.

4. Importance of Research

The success of any curriculum depends on its correct understanding, adoption and implementation by the teachers. Therefore, it is assumed that determining to what extent the curriculum meets the needs and expectations of teachers, as well as revealing the existing problems during implementation. In this study, since the chemistry curriculum applied in Nigeria and Türkiye is evaluated and compared in terms of the content, input, process and dimension, it is assumed that it will contribute to new studies and a new perspective for other researchers in the field of curriculum evaluation. This study will also be important in learning teachers' views regarding the chemistry curriculum in both Türkiye and Nigeria and for the teachers of both countries to have the opportunity to see different practices related to their fields in other countries. In addition, it is thought that this study will be a source for new studies and national literature on chemistry curriculums in the future. It was observed that Studies were carried out to show the problems and how effective the 12th-grade chemistry curriculum was. However, comparative evaluation is few, especially in 12th-grade chemistry. For this reason, the present study is based on the 12th-grade curriculums; since the 12th grade is the final grade in both Nigeria and Türkiye, it is assumed it will give more accurate information about the functioning and implementation of the curriculum. It is also essential to evaluate the curriculum with the help of feedback from the teachers implementing it to enhance its effectiveness in Nigeria and Türkiye. As this study is not only limited to evaluating the curriculum implementation, it will help reveal the differences and similarities between the two countries.

5. Theoretical Backgrounds

• Curriculum Basics

According to the National Board of Education, 12th-grade chemistry has 2 study weeks. The students learn chemical phenomena, concepts, and laws important for their professional tasks during teaching. For example, when storing substances, they must be able to consider the interaction of substances and act by the laws of nature in their work and other activities, saving the environment and energy. It examines critical aspects of sustainable development, particularly the environmental impact of logistics, from a natural perspective. It concerns the chemical phenomena important for the environment and the profession. To that end, one must be familiar with the chemical properties of the most common elements and inorganic and organic compounds, such as food nutrients and additives, flammable liquids, detergents, and acids [9]. It can interpret the factors affecting the health and safety of substances such as cosmetics, flammable liquids, acids, bases, and pesticides in the labelling of products and consider the unique properties of importance in their work so as not to endanger their safety, the safety of others and the environment. From these requirements, it is understood that when teaching 12th-grade chemistry, one must focus on integrating these sciences into everyday life. However, for students to learn to make such interactions flawlessly, they need to know the basics of science. Because of this, students need to be given theoretical knowledge, and based on it, they are taught to understand how this information can be applied to real-world situations (especially in the workplace). In Türkiye and Nigeria, 12th-grade teachers and trainers have long known that the chemistry of a 12th grade needs to be taught and studied differently than, for example, in primary school. 12th-grade chemistry must be connected to their field of study, and that particular emphasis is placed on practicality and closeness to left-field Fields [10]. On the other hand, for general education in Türkiye and Nigeria, every citizen must have a realistic and accurate worldview, which 12th-grade chemistry strives to choose in many different ways. Each student must develop a correct understanding of the world, being, environment, and various influences based on current knowledge.

• Chemistry Curriculum

A curriculum is the complete experiences, knowledge, skills, and activities systematically planned to educate the learners for gainful employment or usefulness. Esu (2007) and Oforma (2009) argued that curriculum is the learning experiences planned or guided by the school, whether carried out in groups or individually, either in or outside the school. A curriculum is viewed as a comprehensive scheme that specifies and completely describes the person to be educated, the educational content, how to deliver the contents, and the expected outcome of the education within the confined environment that promotes quality assurance [11]. Therefore, the Chemistry curriculum is a document that stipulates the topic, the content, the activities of teachers and students, and the expected outcomes (performance objectives) within the specified stage and method of teaching and learning process in chemistry. The curriculum also describes the teaching/learning materials and evaluation process for given chemistry instruction. The chemistry curriculum aims to develop the learner for helpful living in a society, which creates the culture (FME, 2007). Therefore, the chemistry

curriculum becomes a blueprint for realising societal aspirations and needs through chemistry education. The Curriculum carefully stipulates the total environment in which chemistry education takes place in an attempt to discover the national objectives. The environment includes the subject matter, the learner, the teacher, and the physical and psychological factors. Thus, the chemistry curriculum is planned and structured to address the nation/society's needs and aspirations.

6. Evaluation Models

Various evaluation models were introduced in the 1940s, 1950s, and 1960s. Tyler's objective model, Stake's responsive model, Scriven's Goal Free model, and last but not least, Stufflebeam's CIPP model are just a few of the models that have been established and extensively used in educational assessment generally and academic curriculum evaluation in particular. The essential concepts of Tyler's goal model include aligning pre-behavioral objectives to the actual outcome. According to Tyler, evaluation can be defined as a comparison between expected and actual results. Tyler's model is based on objective-oriented theory, as the name suggests. The curriculum is viewed as a technique for achieving an educational goal in the model. The responsive model proposed by Stake foregoes some precision in measurement to improve the utility of findings for those involved in and around the curriculum. Suppose the evaluation orients more openly to curriculum activities than curriculum intents. In that case, it is termed responsive if it reacts to audience demand for information, and the various value perspectives present are alluded to in reporting the curriculum's success and failure. "A methodology in which official or stated curriculum goals and objectives are withheld or filtered from the evaluator," according to Scriven's definition of a goal-free evaluation of curriculum evaluation. The term "goal" differs from "objective" in this context. "Broad declarations of a curriculum's aims or intended outcomes, frequently not explicit enough to be quantified and often relating to long-term rather than short-term expectations," according to the definition. The Context, Input, Process, and Product (CIPP) model, developed in the late 1960s by Daniel Stufflebeam, is one of the most well-known and well-tested models. The approach was first developed to improve and accountability school curriculums in the United States. Later on, the concept was widely used in various disciplines, including social curriculums, health professions, industry, and even the military. "A comprehensive framework for guiding assessments of curriculums, projects, personnel, products as well as evaluation systems," according to the model (Vo, 2018).

• Stufflebeam's CIPP Evaluation Model

Policy boards, curriculum and project staff, directors of various services, school principals, accreditation officials, school district superintendents, instructors, college and university executives, military leaders, physicians, and assessment specialists are all expected to apply the model. The approach is set up for organization-wide internal assessments, individual service provider self-evaluations, and contracted external evaluation fields [12]. Individual service providers, Policymakers, curriculums, and project staff can use these four interconnected types of evaluation to help commence, develop, and implement sound curriculums, projects, or other services; to reinforce existing curriculums or services; to meet the accountability criteria of oversight groups, sponsors, and constituents; to disseminate effective practices, and to contribute to knowledge by conducting or contracting for evaluations. The CIPP's basic framework was comprehensive (context assessment to help with goal development, input evaluation to aid with proposal shaping, process evaluation to assist with execution, and product evaluation to support recycling decisions). This approach contains a complete basic structure, including the evaluation of context to facilitate creating objectives, evaluation of input to aid in curriculum preparation, the process for directing curriculum enforceability, and product evaluation to determine curriculum success. The curriculum evaluation was carried out for accountability measurement and feedback on curriculum implementation. Accountability metrics should be included if the curriculum review aims to inspect faults in accomplishing educational objectives regarding quality, the quantity of yield, and cost-effectiveness. The assessment is carried out when the evaluation strives to eliminate constraints and continuously enhance performance at both the person and the institution; it is appropriate to provide feedback on how the curriculum is being implemented [13]. The abbreviation CIPP stands for context, input, process, and product. The CIPP evaluation methodology has been widely used to assess curriculums and policies and can also be used to determine curriculum on a small scale. The following items must be evaluated in every component of the activities:

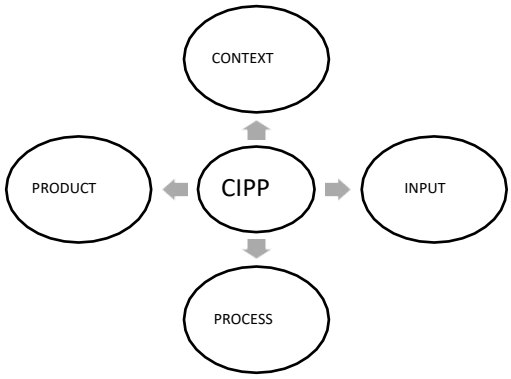

Figure 1: CIPP Evaluation Model

7. Context Evaluation

Context evaluation offers a rationale for implementing a curriculum or curriculum. The curriculum's policies and objectives that support the institution's vision, mission, relevant environment, recognition of needs, opportunities, and specific problem diagnostics can all be examined on a vast scale. A typical example of context evaluation is a needs assessment. On a small scale, it can evaluate the learning curriculum's goals—an evaluation of the context to make a planned decision.

8. Input Evaluation

Input evaluation to suggest information on sources that can be leveraged to achieve curriculum goals. Input evaluation establishes a problem-solving strategy and creates and designs curriculums. Budgets, suggestions, timelines, and processes are included in the outcomes of the input evaluation. Input evaluation can also be completed in learning activities to expose sources that can be utilised in the learning process, hence helping to construct effective learning strategies. The following items can be part of the input: student component, teacher, infrastructure, media, etc. The principle of this examination is to assist in structure decisions.

9. Process Evaluation

Process evaluation aims to endow feedback to the individual accountable for the curriculum or curriculum's activities. This review is part of monitoring probable sources of failure, preparing preparatory information to make decisions, and elaborating on the process that occurred. Data-collecting instruments are obligatory for process evaluation (observation sheet, assessment scale, field notes, etc.). The process evaluation's rationale is to help with the implementation choice.

10. Product Evaluation

The objective of product evaluation is to measure as well as interpret the accomplishment of goals. Measurement of the impact of the expected as well as unexpected is also a part of product evaluation. The evaluation is done twice during the curriculum and once after. Stufflebeam suggests doing product evaluations for four factors: impact, sustainability, efficacy, and transportability. An instrument (such as a test sheet, observation sheet, or interview sheet) to appraise behaviour change after the learning curriculum is implemented is needed for product evaluation. The principle of product evaluation is to support the recycling decision.

In technical educational activities, there are three stages:

- input is the community needs as well as resources.
- process is learning.
- output is workforce skills.

With the help of the CIPP evaluation model, four types of decisions will be produced:

- a decision in planning that influences the choice of goals and objectives
- a decision that ensures the design of strategies, as well as procedures, are best to meet the goals
- implementing the decision: the work done to bring and improve by choosing the methods, designs, and strategies.
- 4) repeat the decision to ascertain continuity, changes or terminate curriculum activities (Warju, 2016).

The CIPP model is based on exploratory learning but is strongly associated with dialogue-shaped interaction in the information construction process. According to the CIPP model, the learning process focuses on the dialogical solution of authentic problems. In dialogical problem solving, however, each party to the dialogue outsources its thinking and reflects it in a dialogical relationship with the thoughts of others. Of course, this pedagogical method is exciting and suitable for close contact with students during teaching. Reviewing the material through dialogue is an excellent method of teaching. Because every student is involved in it, and if someone does not understand something, the conversation can make it easier to understand complex things. One of the downsides is that maintaining a dialogue requires much information. Therefore, before using this method, students must be given information based on the information they received earlier. This method is well suited as a recap of the news that students may have difficulty with. Then, during the dialogue with the teacher in small groups, students can find answers to questions and better learn lesson material.

11. Eisner's Criticisms Evaluation Model

This model was developed by Eisner in 1975. This model was based on the field of art and criticism. Eisner argues that the new curriculum should be evaluated by people with extensive knowledge in the field and the ability to criticise, just like in any other area. In education, the person's ability to decide what to observe, how to follow, and how to evaluate depends on the person's extensive knowledge of the curriculum design [14]. Therefore, experts are asked the following questions when evaluating a curriculum: "What happened due to the new curriculum during an academic year at school? What are the key events, how did they unfold, how did students and teachers take part in them, what are their reactions, and what did students learn from the new curriculum? These questions focus on the process, school life, and school [14]. In this evaluation model, there are three dimensions: Description, Interpretation, and evaluation:

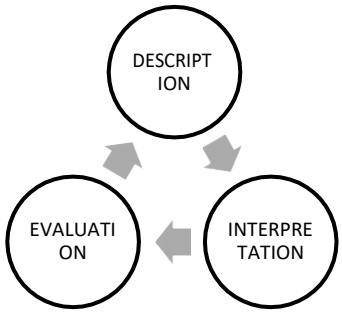

Figure 2: Eisner's Criticisms Evaluation Model.

- ***Description***: In this dimension, features related to the quality of education are well described and defined.
- ***Interpretation***: In this dimension, some possible outcomes of these events are predicted and interpreted by considering the events that occurred due to the curriculum implemented.
- ***Evaluation***: In this dimension, judgment is made about the curriculum's value based on the results of description and interpretation [15]. Meanwhile, some traditional evaluators disliked and criticised Eisner's model, which focuses on qualitative evaluation, because it needed to comply with the usual methodological processes [16].

11.1 Tyler Evaluation Model

Ralph W. Tyler (1942) is an essential educationist in developing educational evaluation models. Tyler's view of the curriculum was that it should adhere to clearly defined goals, such as; (the student, society, and subject) and measurable behaviours. Tyler's' model is known as the Tylerian or Tyler's objective model, which was first determined in the 1940s. The basic principles of this model involve matching the pre-behavioural objectives with the actual outcome [17]. Therefore, as the name implies, curriculum evaluation aims to indicate whether the objectives have been achieved. The achieved goals are known as successful. However, if the objectives are not fulfilled, an interpretation is made by referring to them as unsuccessful. The unachieved objectives indicate that the instructional curriculum needs to be improved. In contrast, achieved goals show a successful instructional education curriculum. However, as the objectives are prompt to change during the curriculum's implementation or may not have clear objectives, Tyler's objectives model can only be used to evaluate those with clear and stable goals. Tyler's model application has been in use for many years because it is very understandable and easy to implement during the evaluation, and it is the most frequently used model today, with the concepts of reaching International Standards and accreditation coming to the fore [18]. In Tyler's model, four basic steps should be followed systematically when evaluating a curriculum; these are:

1. Defining the objectives of learning experiences
2. Outlining the learning activities for attaining the defined objectives
3. Organising the learning activities to achieve the defined objectives
4. Evaluating and measuring the defined goals by comparing the performance data with the purposes specified.

11.2 Metfessel-Michael Evaluation Model

This model was developed by Metfessel and Michael and was influenced by Tyler's evaluation model. In this model, as in Tyler's model, in educational evaluation, it is argued that products should be evaluated in the decisions to be taken [19]. It is a global-based model consisting of principles that can guide curriculum evaluation experts in the evaluation process of school curriculums. The model is target-oriented and has been supported that it can be used primarily in evaluating higher education institutions. Metfessel and Michael aim to evaluate school curriculums by including school personnel during the evaluation process. The evaluation process is described in the eight steps listed below:

• **Identification of Participants:** Ensuring that people who make up the entire school community, such as administrators, teachers, students, and citizens, are involved in curriculum evaluation processes.

• **Formulation of Goals:** Hierarchical arrangement of expected products from general to specific by creating a structure that progressively determines the general and specific goals of the curriculum.

• **Reflecting the Goals in the Curriculum:** Transforming the specific goals into an application form by expressing them clearly.

• **Planning of Measurement Tools:** Selecting or developing appropriate measurement tools to measure the curriculum's effectiveness in terms of the individual.

• **Making Observations:** Regularly using various measurement tools to measure behavioural changes throughout the application.

• **Analysis of Data:** Analyzing the collected information using appropriate statistical tools and processes.

• **Data Analysis:** Interpreting data related to specific objectives according to evaluation standards and values while considering the expected performance levels. These results will determine the direction of development and progress of the student. It will also give an idea of the effectiveness of the entire curriculum.

• **Developing Suggestions:** Based on the information obtained, to contribute to the development of the curriculum, producing recommendations about further applications or about changing or correcting the specific goals of the curriculum [19]

12. Provus' Differences Evaluation Approach.

The Provus' curriculum evaluation model, an example of the experimental-positivist consisting of four primary and five stages, was coined Provus. This model was based on revealing the differences between performance and the standards set. According to the determined differences, improvements and corrections will be made in the curriculum. Provus (1969), In his evaluation model, outlined the four main components as follows:

1). Setting and determining the curriculum standards, 2). Determining curriculum performance, 3). Comparing performance with standards, 4). They are determining whether there is a difference between performance and standards. The abovementioned processes are carried out sequentially at every stage and according to the information obtained. In this curriculum evaluation process, the information about the differences is reported to the decision-makers. According to Ornstein & Hunkins (2004), the decision options are as follows:

- Going to the next level
- Making the previous stage usable again or recycling.
- Restarting the curriculum from the initial.
- Regulating performance and standards.
- Completing the curriculum

At the end of each stage, the difference determined in the evaluation is reported to the decision- makers, and a decision is made about the stage.

The five stages of the evaluation process of Provus' differences approach and evaluation model are as follows [20]:

1. *Design:* The curriculum design is compared with predetermined standards at this stage. If a difference between the draft and the standards is observed, this difference is reported to the decision-makers. Based on that, the decision options regarding the curriculum's future are to be chosen.
2. *Build:* Various curriculum elements (student behaviours, opportunities, and methods) are evaluated at this stage. The differences between the formation of the curriculum and the formation of the criteria are reported to the decision-makers.
3. *Process:* At this stage, an evaluation is made in terms of student and staff activities, functions, and relationships. The observed

differences are to be reported to the decision-makers as well.
4. *Product:* At this stage, it is aimed to evaluate all the outputs achieved at the end of the process. Evaluation is done with the original goals in mind. Product evaluation is viewed in terms of the school-society relationship. The outputs at this stage constitute the performance, and the curriculum design creates the standards.
5. *Cost-Benefit Analysis:* At this stage, the curriculum outputs are compared with the outcomes of the equivalent curriculums. The results of the analyses constitute the performance, and the data obtained from the comparable curriculums include the standards.

13. Methodology

This section provides the selected research design, population sample, sample selection, data collection tools, data collection process, and data analysis.

14. Research Design

In this comparative evaluation study, both qualitative and quantitative were adopted to evaluate and compare the 12th-grade chemistry curriculum according to the four dimensions (context, input, process, and product) of the CIPP model developed by [21]. based on the teachers' opinions. To achieve this, a mixed research model, also called an enriched research design, was used in the research. According to [22]. In the mixed-research method, the researcher collects both qualitative and quantitative data simultaneously while comparing the findings to determine whether they support each other. Mixed methods research can also be defined as how a researcher simultaneously combines qualitative and quantitative methods, approaches, and concepts within a study or successive studies [23]. Johnson & Christensen (2010) defined a mixed research method as research that includes different ideological or theoretical paradigms, such as qualitative and quantitative research. Similarly, Morse (2010) sees mixed-method research as a complete research method with supportive strategies described by combining qualitative and quantitative methods and characterised as simultaneous and sequential. Carrying out research with a mixed method is to present, analyse and bring together the events within a framework using various methods accordingly. Kıral & Kıral (2011) also believed that the mixed-research method combines quantitative and qualitative research approaches during one or more stages of the research process. The mixed method, which constitutes qualitative and quantitative research, refers to two cultures and paradigms. The qualitative research method compares different features of people and events without relying on measurements or numerical data. In contrast, quantitative research aims to compare different data by basing it on statistical measurements and quantities [24]. It aims to explain and generalise the causality relationship by developing an objective attitude toward events and phenomena [25]. According to Creswell (2006), researchers generally in the first stage collect quantitative data, while qualitative data in the second stage and quantitative data in the third stage, in large-scale, financially supported projects to validate the results. In this kind of research, also known as multiple studies, each project is reported separately as an independent. However, the research project is generally referred to as a mixed-research method [26].

In this research, the descriptive, sequential mixed Design (qualitative) collects quantitative and qualitative data sequentially to understand a research problem, use the results, and compare the data (Creswell 2012). In this study, firstly, quantitative data were collected. Afterwards, qualitative data were used to support the quantitative data, and the results were compared to intensify the interpretations. However, a general picture of the research problem was formed by interpreting the obtained quantitative and qualitative data, which were collected and analyzed subsequently.

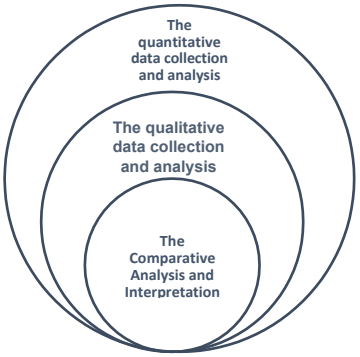

Figure 4: Descriptive-Sequential Mixed Pattern.

The descriptive-sequential Mixed Pattern diagram is shown below;
In this process, the teachers' views/perceptions on the 12th-grade chemistry curriculum, according to the four dimensions (context, input, process, and product) of the CIPP model, were collected using the Google form, which was created based on the five-point Likert. The qualitative data of the research was designed as phenomenology research to intensify the interpretation of the quantitative data and to compare the 12th-grade chemistry curriculum in both Türkiye and Nigeria. An interview technique was used to apply this method. According to Merriam (2009), phenomenology research is perceived as a philosophy that impacts all qualitative research, and it is a type of research that also independently has focus and methodological strategies. The main course discussed in the qualitative dimension of this research is the 12th-grade chemistry curriculum implemented in both countries. The similarities and differences between 12th-grade chemistry in both countries have been revealed.

15. Population, Sample, and Participant Group

The population of the research consists of 12th-grade chemistry teachers from Türkiye and Nigeria in general. The sample of the research consists 203 of 12th-grade chemistry teachers in Nigeria and 162 12th-grade chemistry teachers in Türkiye determined by random sampling method. In random sampling, the inclusion of the elements in the population sample is based entirely on chance [27]. Research is mainly done on sample clusters due to cost, control, and ethical obligations, and the results are generalized to the relevant population [28]. In this research, instead of reaching the entire study population, accessible random sampling was used to increase the efficiency of the study. In this research, the

accessible sampling method, one of the random sampling methods, was used in the research. Accessible sampling method; due to some constraints in terms of distance, time, money and labour, the sample is selected from easily accessible and applicable units [29]. In this study, social media, such as email, WhatsApp, Facebook, etc., were used to make it easy for the researchers to reach the targeted population from both countries.

16. Data Collection Tools

This section explains the data collection tools used in the research. The validity- reliability studies of the scale developed by the researcher are also included. A Google Scale form related to the Curriculum Evaluation, written in English and Turkish, was used to collect quantitative data. A semi-structured Interview was used to collect qualitative data from the teachers in Türkiye, while an online interview (through Zoom) was used to collect data from teachers in Nigeria.

17. Quantitative Data Collection Tools

The researcher developed a Google scale form according to Stufflebeams' evaluation model to collect the participants' opinions regarding the 12th-grade chemistry curriculum implemented in both Türkiye and Nigeria. In line with the literature review and expert opinions, the scale consisted of two parts to describe the group in which the study was conducted. In the first part, there are demography questions which consist of age, gender graduated school type, the socio-economy status of the school, the number of students available in the class they taught, years of service, availability of materials in the classroom\laboratory, the status of the teacher taking part in the in-service training related to the curriculum and the department they graduated from are included in the personal information form. The data obtained from this section were used as an independent variable in comparing participant views.

In the second part of the scale, an item pool of 32 items was created, which was aimed to reveal the opinion of 12th-grade chemistry teachers regarding the chemistry curriculum. In creating the items, care was taken to write clear and understandable statements that directly affect the scale's reliability. To ensure the clarity and validity of the scale, the 32 questions created were examined by experts in scientific research. As a result of this examination, eight items were decided to be removed from the scale, as they contained expression disorder and were found irrelevant to curriculum evaluation according to the CIPP model. The scale, which consists of the remaining 24 items, and the pilot study were carried out on five chemistry teachers in Türkiye to give the final shape before the actual application. At the end of the pilot study, one-to-one interviews were held with some teachers voluntarily. Thus, a 24-item scale form was obtained, written in Turkish and English.

The prepared scale is a Likert-type scale and was prepared as a 5-point scale. For each item, the respondent is asked to choose one of the options. The answer options are (1) "I strongly disagree", (2) "I disagree", (3) "I partly agree," (4) "I agree", and (5) "I strongly agree", starting from the most negative to the most positive.

18. Qualitative Data Collection Tools

The researcher created a semi-structured interview form to collect the qualitative data of the research and was sent to 6 field experts for clarity. While preparing the interview form, care was taken to ensure the questions were highly understandable and avoid the one-sided driving question. The research was designed according to the CIPP model. Thereby, the interview questions were prepared by the dimensions of "Context", "Input", "Process" and "Product". The interview was conducted through the Zoom curriculum at the teachers' convenience. In the interviews, in-depth data were tried to be obtained through the stated interview questions. At the end of the interview, the teachers were asked if they had any thoughts they wanted to add, and notes were taken.

The interview form consisted of 20 questions, five from each dimension and demography information of the participants. The interview question was created in English and Turkish and applied in Türkiye and Nigeria. During the implementation process, it was decided to record the interviews instead of being recorded in writing to avoid misinterpretation of data during transcription. During the interview process, interviews were held with nine volunteer teachers, five from Nigeria and four from Türkiye. The teachers interviewed were contacted by phone, the content was discussed in general, and the appropriate periods were determined. The interviews lasted between 20-35 minutes. The participants were informed that the interviews would be recorded, these recordings would be analysed in the computer environment, and the transcribed data would be sent to participants for confirmation. The participants were informed that the data obtained from the interviews would be used only for research purposes in line with ethical principles, and these records would be kept confidential. Participants approved the recording of the discussions in line with these explanations.

In the analysis process, the audio recordings of the interviews were first listened to. In this direction, the transcripts of the interviews were made and prepared for analysis, and the data collected were coded as follows. The teachers whose opinions were consulted were given a code (NT1, NT2, NT3, NT4, and NT5) while (TT1, TT2, TT3 and TT4) respectively. NT means Teachers from Nigeria, and TT means teachers from Türkiye.

19. Data Analysis

• Analysis of Quantitative Data

The distribution of the demographic characteristics of the 12th-grade chemistry teachers from both Türkiye and Nigeria and their school features were calculated with frequency (f) and percentage (%) by making use of descriptive analysis. The collected data from the participants were transferred to the computer environment after making the necessary arrangements and analyzed using the Statistical Package for Social Science (SPSS). A code was given to each answer since the measurement tools were prepared as a five-point Likert scale. From this point of view, "5" for "I strongly

disagree", "4" for "I disagree", "3" for "I partially agree", "2" for I agree", and "1" for "strongly agree". According to these scores, the teachers' opinions were scored and transferred to the relevant curriculum for analysis. Afterwards, the dimensions of the CIPP evaluation model used in the questionnaires, the total scores for each dimension, standard deviation (SD), and arithmetic mean (X) were calculated according to the total scores and given in tables.

• Analysis of Qualitative Data

The qualitative data analysis started by thoroughly listening to recorded interviews later transcribed using writing facilities. Since the interviews were conducted in two different languages (Turkish and English) in both countries, the transcribed Turkish part was carefully translated into English while trying to make inferences from the whole text. Interviews were conducted with eight chemistry teachers, five from Nigeria and three from Türkiye, who were selected voluntarily from the different schools. The individual interviews were recorded with a Zoom meeting curriculum and by note-taking technique.

The interviews were arranged by transferring them to the computer environment in Word format. The transcribed data were kept in the computer environment to prevent data loss and misinterpretation. The transcribed responses were also sent to the interviewed participants for their approval and, if there were missing points during the process. Within the framework of the purposes of the research, the dimensions of the CIPP model of evaluation were grouped and presented with exact quotations from the participant's responses. Afterwards, codes were used in giving the reactions in question, and the "NT" code for the teacher was assigned to responses from Nigerian Teachers, while "TT" codes were assigned to Turkish teachers. The interview questions and the direct quotation of the participants are kept with researchers.

• Findings and Comment

In this section, the distribution of the teachers participating in the research in Nigeria and Türkiye according to the content, input, process, and product dimension of the CIPP model of the curriculum evaluation are shown below: findings and comments are included. The infographic data and tables are kept with the researchers for those who might need it.

• Quantitative Research Findings in Nigeria

In the quantitative dimension of the research, descriptive statistics related to the analysis of teacher questionnaires were developed based on Stufflebeam's Context-Input-Process-Product Model of curriculum evaluation. The opinions of the 12th-grade chemistry teachers working across Nigeria were collected through an online Google form prepared based on the CIPP model of curriculum evaluation consisting of four dimensions, and a total of 24 items were interpreted by calculating the frequency (f), percentage (%) and Standard Deviation (SD) distributions with the descriptive analysis method using the SPSS for Mac iOS curriculum.

• Context Dimension

"Opinions of teachers regarding the ***context*** evaluation dimensions of the 12th-grade Chemistry curriculum in Türkiye and Nigeria" expressed as the research sub-problem. The mean, percentage (%), and frequency (*f*) calculations were made to determine the teachers' thoughts about the context dimension interpreted and presented below; Opinions of teachers regarding the ***context*** evaluation dimensions of the 12th-grade Chemistry curriculum in Türkiye and Nigeria". In Nigeria (203 teachers) and Türkiye (162 teachers) participated in the six questions which were used to gather data. After analysis, the average score range in Nigeria was 2.04-2.56 with a standard deviation of 0.87-1.44, while in Türkiye it was 2.59-2.67 with a standard deviation of 0.59-0.86. The interpretation of the results was made based on the items designed in the evaluation dimensions as follows:

Item 1. The general objectives of the 12th-grade Chemistry curriculum are clearly stated.

In Nigeria, 12th-grade chemistry teachers' responses concerning this item show an average of ($\bar{X}$ =2.25) with (SD= .87). Based on the Five-Linkert scale of the questionnaire, 43.1% of the teachers responded with "I agree," followed by 30.1% with "I partially agree" and then 19.8% with "I strongly agree". The remaining 5.9% of the teachers responded with "I Disagree", while 1.0% responded "I Strongly disagree", the lowest value. In Türkiye, 12th-grade chemistry teachers' responses concerning this item show an average of ($\bar{X}$ =2.66) with (SD= .67) of standard deviation. Based on the Five-Linkert scale of the questionnaire, 39.5% of the teachers responded with "I agree" followed by 55.6% with "I partially agree". The remaining 4.3% of the teachers responded with "I Disagree", while 0.6% expressed "I Strongly disagree," which is the lowest value. However, none of the teachers strongly agreed with the item.

Item 2. The general objectives of the 12th-grade Chemistry curriculum are attainable.

In Nigeria, the teachers' opinions in the second item of the content dimension show the mean average value ($\bar{X}$ = 2.41) with (SD=1.01) standard deviation, respectively. The responses with high value are 35.6% of "I partially agree" followed by 30.7% of "I agree". The other responses are "I disagree" with 9.9% and 2.5% with "Strongly disagree". This shows that very few teachers have disagreed with the attainability of the general objective of the 12th-grade chemistry curriculum. In Türkiye, the teachers' opinions show the mean average value of ($\bar{X}$ = 2.59) with (SD=.67) standard deviation, respectively. The responses with a high percentage are 49.4% of "I agree" followed by 40.1% of "I partially agree". The other answers are "I disagree" with 9.9% and then .6% with "I strongly agree". This shows that very few teachers have disagreed with the attainability of the general objective of the 12th-grade chemistry curriculum in Türkiye.

Item 3. The outputs of the 12th-grade Chemistry Course curriculum are like helping students achieve general goals.

In Nigeria, it is seen that the average of the teachers' opinions about this item have a mean average of ($\bar{X}$ =2.56) with (SD = 1.44) of standard deviation, and 30.7% at the level of "I agree". Among the

teachers' opinions who participated in the form, "I strongly agree" ranked second with 28.2%, followed by "I strongly disagree" with 19.3%. The percentages of “I partially agree” with 16.8% and “Disagree” with 5.0% have a meagre percentage. In Türkiye, it is seen that the average of the teachers' opinions about this item have a mean average of ($\bar{X}$ =2.65) with (SD= .76) of standard deviation and 50.6% at the level of "I agree". Among the opinions of the teachers who participated in the form, "I partially agree" ranked second with 32.7%, followed by "I disagree" with 15.6%. The percentages of “I strongly agree” and “I strongly disagree” with .6% each have a meagre portion.

Item 4. The 12th-grade chemistry topics and the time allocated to the topics are compatible.

In Nigeria, the 12th-grade chemistry teachers' responses concerning the fourth item show an average of ($\bar{X}$ =2.22) with (SD= .97) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree,” which has the highest value of 38.6%, followed by 25.2% with “I partially agree” and then 23.2% with “I strongly agree”. The remaining 9.9% of the teachers responded with “I Disagree”, while 1.0% responded “I Strongly disagree”, the lowest value. In Türkiye, the 12th-grade chemistry teachers' responses concerning the fourth item show an average of ($\bar{X}$ =2.67) with (SD= .87) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest percentage of 50.0%, followed by 26.5% with “I partially agree” and then 19.8% with “I disagree”. The remaining 2.5% of the teachers responded with “I strongly agree”, while 1.2% responded “I Strongly disagree”, the lowest value.

Item 5. The outcomes of the 12th-grade chemistry curriculum are clearly stated.

In Nigeria, it is seen that the average of the teachers' opinions about this item have a mean average of ($\bar{X}$ =2.22) with (SD= .97) standard deviation, and the views of "I agree" have the highest value of 42.4% percentage. Among the teachers' opinions who participated in the form, "I strongly agree" ranked second with 27.9%, followed by "I partially agree" with 22.3%. The percentages of “I disagree” at 5.4% and “I strongly disagree” at 0.5% have very low percentages. In Türkiye, it is seen that the average of the teachers' opinions about this item have a mean average of ($\bar{X}$ =2.62) with (SD= .81) standard deviation, and the views of "I agree" has the highest value of 46.9% percentage. Among the views of the teachers who participated in the form, "I partially agree" ranked second with 34.0%, followed by "I disagree" with 14.2%. The percentages of “I strongly disagree” at 1.2% and “I strongly agree” at 3.7% have very low percentages.

Item 6. The theoretical information in the 12th-grade chemistry course curriculum is sufficient.

In Nigeria, the 12th-grade chemistry teachers' responses concerning the sixth item show an average of ($\bar{X}$ =2.04) with (SD= 1.00) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest value of 37.6%, followed by 34.2% with “I strongly agree” and then 19.8% with “I partially agree”. The remaining 5.9% of the teachers responded with “I Disagree”, while 2.5% expressed “I Strongly disagree,” which is the lowest value. In Türkiye, the 12th-grade chemistry teachers' responses concerning the sixth item show an average of ($\bar{X}$ =2.61) with (SD= .82) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest value of 46.3%, followed by 34.26% with “I partially agree” and then 13.6% with “I disagree”. The remaining 4.3% of the teachers responded with “I strongly agree”, while 1.2% responded “I Strongly disagree”, the lowest percentage in this aspect.

• Input Dimension

The opinions of teachers regarding the ***input*** evaluation dimensions of the 12th-grade Chemistry curriculum in Türkiye and Nigeria”. In Nigeria (203 teachers) and in Türkiye (162 teachers) participated in the six questions which were used to gather data. After analysis, the arithmetic mean in Nigeria was 2.11-1.74 with a standard deviation of 1.11- .88, while in Türkiye it was 2.65 -2.23, with a standard deviation of .78 - .90. The interpretation of the results was made based on the items designed in the evaluation dimensions as follows:

Item 1. The texts and lessons in the textbook are remarkable for students.

In Nigeria, the teachers' opinions show the mean average value ($\bar{X}$ = 2.11) with (SD=1.11) of standard deviation, respectively. The responses with high values are 37.6% of “I strongly agree” followed by 28.2% of “I agree”. The other answers are “I Partially agree” with 22.8%, “I disagree” with 6.9% and then 4.0% with “I strongly disagree”. These show that most teachers believe the textbook's texts and lessons are remarkable for students. In Türkiye. the teachers' opinions show the mean average value ($\bar{X}$ = 2.65) with (SD=.84) of standard deviation, respectively. The responses with high values are 43.8% of “I agree” followed by 37.0% of “I partially agree”. The other answers are “I disagree” with 12.3% and “I strongly disagree” with 2.5%, and then 4.3% with “I strongly agree”. These show that most teachers believe the textbook's texts and lessons are remarkable for students.

Item 2. Students' prior knowledge and skill levels are sufficient to implement the curriculum.

In Nigeria, the 12th-grade chemistry teachers' responses concerning the second item show an average of ($\bar{X}$ =2.06) with (SD= 1.04) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest value of 38.6%, followed by 34.2% with “I strongly agree” and then 16.8% with “I partially agree”. The remaining 6.9% of the teachers responded with “I Disagree”, while 3.5% expressed “I Strongly disagree,” which is the lowest value. In Türkiye, the 12th-grade chemistry teachers' responses concerning the second item show an average of ($\bar{X}$ =2.46) with (SD= .88) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest value of 49.4%,

followed by 27.8% with “I partially agree” and then 11.1% with “I disagree”. The remaining 9.9% of the teachers responded with “I strongly agree”, while 1.9% responded “I Strongly disagree”, the lowest value.

Item 3. The textbook has a structure that will encourage students to learn.

In Nigeria, the average means of the teachers' opinions is ($\bar{X}$ =1.93) with (SD=1.02) of standard deviation, respectively. Most of the teacher's responses are "I strongly agree" with 42.6%. The other opinions of the teachers who participated in the form "I agree" took the second place with 33.2%, followed by "I partially agree" with 15.3% and "I disagree" with 15%, and 2.5% of the teachers expressed an opinion at the level of "I strongly disagree" respectively. In Türkiye, the average means of the teachers' opinions is ($\bar{X}$ =2.46) with (SD=90) of standard deviation, respectively. Most of the teacher's responses are at the "I agree" level, with 48.8%. The other opinions of the teachers who participated in the form "I partially agree" took the second place with 27.8%, followed by "I strongly agree" with 10.5% and "I disagree" with 10.5%, and 2.5% of the teachers expressed an opinion at the level of "I strongly disagree" respectively.

Item 4. The textbook has the feature of facilitating the realisation of the gains.

In Nigeria, the 12th-grade chemistry teachers' responses concerning the fourth item show an average of ($\bar{X}$ =1.88) with (SD=.89) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree”, which has the highest value of 39.6%, followed by 39.1% with “I strongly agree” and then 16.8% with “I partially agree”. The remaining 1.5% of the teachers responded with “I Disagree”, and 3.0% responded “I Strongly disagree”, the lowest value. In Türkiye, the 12th-grade chemistry teachers' responses concerning the fourth item show an average of ($\bar{X}$ =2.38) with (SD=.85) standard deviation. Based on the Five-Linkert scale of the questionnaire, the teachers responded with “I agree,” which has the highest value of 51.9%, followed by 29.0% with “I partially agree” and then 10.5% with “I strongly agree”. The remaining 6.2% of the teachers responded with “I Disagree”, and 1.5% expressed “I Strongly disagree”, the lowest value.

Item 5. The topics in the textbook are consistent with the achievements of the course.

In Nigeria, the average means of the teachers' opinions is ($\bar{X}$ =1.90) with (SD=.95) of standard deviation, respectively. Most of the teacher's responses are at the level of "I agree" with 40.6%. The other opinions of the teachers who participated in the form "I strongly agree" took the second place with 39.1%, followed by "I partially agree" with 14.4% and "I disagree" with 3.0% and 3.0% of the teachers expressed an opinion at the level of "I strongly disagree" respectively. In Türkiye, the average means of the teachers' opinions is ($\bar{X}$ =2.30) with (SD=.80) of standard deviation, respectively. Most of the teacher's responses are at the level of "I agree," with 53.7%. The other opinions of the teachers who participated in the form "I partially agree" took the second place with 27.2%, followed by "I strongly agree" with 11.7% and "I disagree" with 6.2%, and 1.2% of the teachers expressed an opinion at the level of "I strongly disagree" respectively.

Item 6. The topics in the textbook are understandable.

In Nigeria, the teachers' opinions show the mean average value ($\bar{X}$ =1.74) with (SD=.88) standard deviation, respectively. The responses with high values are 47.5% of “I strongly agree” followed by 36.1% of “I agree”. The other answers are “I Partially agree” with 12.9%, “I disagree” with 1.5% and then 2.0% with “I strongly disagree”. In Türkiye, the teachers' opinions show the mean average value ($\bar{X}$ =2.23) with (SD=.78) standard deviation, respectively. The responses with high values are 54.3% of “I agree” followed by 26.5% of “I partially agree”. The other answers are “I strongly agree” with 14.2%, “I disagree” with 3.7% and then 1.2% with “I strongly disagree”.

• Process Dimension

The opinions of teachers regarding the ***Process*** evaluation dimensions of the 12th-grade Chemistry curriculum in Türkiye and Nigeria”. In Nigeria (203 teachers) and Türkiye (162 teachers) participated in the six questions which were used to gather data. After analysis, the arithmetic mean in Nigeria was 2.11-1.74 with a standard deviation of 1.11- .88, while in Türkiye it was 2.39 -2.32, with a standard deviation of .98 - .85. The interpretation of the results was made based on the items designed in the evaluation dimensions as follows:

Item 1. The implementation process of the 12th-grade Chemistry Course Curriculum is suitable for student-centered activities.

In Nigeria, the mean average of the teachers' opinions is ($\bar{X}$ =1.02) and (SD=1.92) standard deviation is seen. Among the opinions of the teachers who participated in the form, 39.6%, “I strongly agree" ranked first, and "I agree" ranked second with 36.6%, while "I partially agree" was 14.4%. These were followed by “I disagree” with 6.9% and “I strongly disagree” with 2.5%. This shows that the implementation process of the 12th-grade Chemistry Course curriculum is suitable for student-centered activities. In Türkiye, the mean average of the teachers' opinions is ($\bar{X}$ =2.39) and (SD=.93) standard deviation. Among the opinions of the teachers who participated in the form, 40.7%, “I agree" ranked first, and "I partially agree" ranked second with 27.8%, while "I disagree" is 14.2%. These were followed by “I strongly agree” with 17.3% and “I strongly disagree” with 0.0%. This shows that the implementation process of the 12th-grade Chemistry Course curriculum is suitable for student-centred activities.

Item 2. The 12th-grade chemistry Collaborative activities are included in the chemistry class.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =.97) and (SD=1.94) standard deviation is seen in this second item of the process dimension. Among the teachers who participated in the form, "I strongly agree" ranked first with

39.1%, while “I agree" ranked second with 37.6%. These were followed by “I partially agree" with 14.9%, “I disagree” with 6.9%, and “I strongly agree” with 1.5%. This shows that the 12th-grade chemistry class includes chemistry collaborative activities. In Türkiye, the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.37) and (SD=.95) standard deviation is seen in this second item of the process dimension. Among the opinions of the teachers who participated in the form, "I agree" ranked first with 46.3%, while “I partially agree" ranked second with 21.0%. These were followed by “I strongly agree" with 16.7%, “I disagree” with 15.4% and “I strongly disagree” with .6%. This shows that the 12th- grade chemistry class includes chemistry collaborative activities.

Item 3. Implementing the 12th-grade Chemistry Course curriculum increases the cognitive success of the students.

In Nigeria, the mean average of the teachers' responses about this item is ($\bar{X}$ =.92) and (SD=1.85) standard deviation. Among the reactions of the teachers who participated in the form, "I agree" ranked first with 42.6%, while “I partially agree" ranked second with 37.6%. These were followed by “I disagree" with 11.4% and “I strongly disagree” with 8.4%. However, the “I strongly agree” option has the missing value. This shows that implementing the 12th-grade Chemistry curriculum increases the cognitive success of the students. In Türkiye, the mean average of the teachers' responses about this item is ($\bar{X}$ =2.33) and (SD=.95) standard deviation. Among the teachers who participated in the form, "I agree" ranked first with 46.9%, while “I partially agree" ranked second with 27.2%. These were followed by “I strongly agree" with 16.7% and “I disagree” with 4.9%. However, the “I strongly disagree” option has the lowest value. This shows that implementing the 12th-grade Chemistry Curriculum increases the cognitive success of the students.

Item 4. The 12th-grade Chemistry Course curriculum implementation process ensures that what is learned is transferred to daily life.

In Nigeria, the average mean of the teachers' opinions about this item is ($\bar{X}$ =.93) and
(SD=1.85) of standard deviation, respectively. Most of the teacher's responses are "I strongly agree" with 44.1%. The other opinions of the teachers who participated in the form "I agree" took the second place with 33.7%, followed by "I partially agree" with 16.3% and "I disagree" with 5.0%, and 1.0% of the teachers expressed an opinion at the level of "I strongly disagree" respectively. In Türkiye, the average mean of the teachers' opinions about this item is ($\bar{X}$ =.33) and (SD=.98) of standard deviation, respectively. Most of the teacher's responses are at the "I agree" level, with 45.7%. The other opinions of the teachers who participated in the form "I partially agree" took the second place with 22.2%, followed by "I strongly agree" with 18.5% and "I disagree" with 11.1%, and 2.5% of the teachers expressed an opinion at the level of "I strongly disagree" respectively.

Item 5. The 12th-grade Chemistry curriculum Implementation process increases students' interest in chemistry.

In Nigeria, the average mean of the teachers' opinions about this item is ($\bar{X}$ =.93) and (SD=1.81) of standard deviation, respectively. Most of the teacher's responses are "I strongly agree" with 46.5%. The other opinions of the teachers who participated in the form "I agree" took the second place with 32.2%, followed by "I partially agree" with 15.3% and "I disagree" with 5.0%, and 1.2% of the teachers expressed an opinion at the level of "I strongly disagree" respectively. In Türkiye, the average mean of the teachers' opinions about this item is ($\bar{X}$ =2.32) and (SD=.85) of standard deviation, respectively. Most of the teacher's responses are at the "I agree" level, with 50.9%. The other opinions of the teachers who participated in the form "I partially agree" took the second place with 25.9%, followed by "I strongly agree" with 14.2% and "I disagree" with 7.4%, and 1.9% of the teachers expressed an opinion at the level of "I strongly disagree" respectively.

Item 6. In the 12th-grade Chemistry Lesson, peer evaluation forms are applied.

In Nigeria, the average mean of the teachers' responses about this item is ($\bar{X}$ =1.05) and (SD=1.91) of standard deviation, respectively. Most of the teacher's responses are "I strongly agree" with 47.5%. The other opinions of the teachers who participated in the form "I agree" took the second place with 25.7%, followed by "I partially agree" with 14.9% and "I disagree" with 11.4%, and 0.5% of the teachers expressed an opinion at the level of "I strongly disagree" respectively. In Türkiye, the average mean of the teachers' responses about this item is ($\bar{X}$ =2.36) and (SD=.92) of standard deviation, respectively. Most of the teacher's responses are at the level of "I agree" with 47.5%. The other opinions of the teachers who participated in the form "I partially agree" took the second place with 24.1%, followed by "I strongly agree" with 15.4% and "I disagree" with 11.7%, and 1.2% of the teachers expressed an opinion at the level of "I strongly disagree" respectively.

• Product Dimension

The opinions of teachers regarding the ***Product*** evaluation dimensions of the 12th-grade Chemistry curriculum in Türkiye and Nigeria”. In Nigeria (203 teachers) and Türkiye (162 teachers) participated in the six questions which were used to gather data. After analysis, the arithmetic mean in Nigeria was 1.88-1.63 with a standard deviation of .76- .94, while in Türkiye it was 2.08 -2.34, with a standard deviation of .75 - .82. The interpretation of the results was made based on the items designed in the evaluation dimensions as follows:

Item 1. Student success reaches the desired level at the end of the 12th-grade chemistry lesson.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =1.88) and (SD=.91) standard deviation is seen in the first item of the product dimension. The other views of the teachers who participated in the form, "I strongly agree," ranked first with

41.6%, while “I agree" ranked second with 34.2%. These were followed by “I partially agree" with 19.8%, “I disagree” with 3.5% and “I strongly disagree” with 1.0%. This shows that most teachers believe that student success reaches the desired level at the end of the 12th-grade chemistry lesson. In Türkiye, the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.34) and (SD=.80) standard deviation is seen in this first item of the product dimension. The other opinions of the teachers who participated in the form, "I agree," ranked first with 45.7%, while “I partially agree" ranked second with 34.6%. These were followed by “I strongly agree" with 13.6%, “I disagree” with 5.6%, and “I strongly disagree” with .6%. This shows that most teachers believe that student success reaches the desired level at the end of the 12th-grade chemistry lesson.

Item 2. Students learn basic chemistry concepts at the end of the 12th-grade chemistry course.

In Nigeria, it is seen that the mean average of the teachers' responses about this item is ($\bar{X}$ =1.64) and (SD=.76) standard deviation. The other reactions of the teachers who participated in the form, "I strongly agree," ranked first with 50.0%, while “I partially agree" ranked second with 37.6%. These were followed by “I disagree" with 11.4% and “I strongly disagree” with 1.0%. However, the option of “I agree” has the missing value. In Türkiye, it is seen that the mean average of the teachers' responses about this item is ($\bar{X}$ =2.21) and (SD=.76) standard deviation. The other responses of the teachers who participated in the form, "I agree," ranked first with 56.8%, while “I partially agree" ranked second with 23.6%. These were followed by “I strongly agree" with 14.2% and “I disagree” with 4.9%. However, the “I strongly disagree” option has the lowest value of .6%.

Item 3. The students' attitudes toward chemistry changed positively at the end of the 12th-grade chemistry lesson.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =1.82) and (SD=.93) standard deviation is seen in the third item of the product dimension. The other views of the teachers who participated in the form, "I strongly agree," ranked first with 45.5%, while “I agree" ranked second with 33.7%. These were followed by “I partially agree" with 15.3%, “I disagree” with 4.0% and “I strongly disagree” with 1.5%. This shows that most teachers believe the students' attitudes toward chemistry changed positively at the end of the 12th-grade Chemistry lesson. In Türkiye, the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.22) and (SD=.75) standard deviation is seen in the third item of the product dimension. The other opinions of the teachers who participated in the form, "I agree," ranked first with 54.9%, while “I partially agree" ranked second with 25.3%. These were followed by “I strongly agree" with 14.2%, “I disagree” with 5.6% and “I strongly disagree” with 0.0%. This shows that most teachers believe the students' attitudes toward chemistry changed positively at the end of the 12th-grade Chemistry lesson.

Item 4. Students' problem-solving skills are developed at the end of the 12th-grade chemistry.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =1.82) and (SD=.90) standard deviation is seen. The other views of the teachers who participated in the form, "I strongly agree," ranked first with 43.6%, while “I agree" ranked second with 36.6%. These were followed by “I partially agree" with 15.3%, “I disagree” with 3.0% and “I strongly disagree” with 1.5%. This shows that most teachers believe students' problem-solving skills are developed at the end of the 12th-grade chemistry. *In Türkiye,* the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.23) and (SD=.82) standard deviation is seen. The other opinions of the teachers who participated in the form, "I agree," ranked first with 53.1%, while “I partially agree" ranked second with 25.9%. These were followed by “I strongly agree" with 15.4%, “I disagree” with 3.7% and “I strongly disagree” with .6%. This shows that most teachers believe that chemistry students' problem- solving skills are developed at the end of the 12th grade.

Item 5. The student's scientific thinking skills are developed at the end of the 12th-grade Chemistry course curriculum.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =1.75) and (SD=.92) standard deviation is seen. The other views of the teachers who participated in the form, "I strongly agree," ranked first with 48.5%, while “I agree" ranked second with 35.1%. These were followed by “I partially agree" with 9.9%, “I disagree” with 1.5% and “I strongly disagree” with 1.5%. In Türkiye, the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.16) and (SD=.81) standard deviation is seen. The other opinions of the teachers who participated in the "I agree" form ranked first at 50.0%, while “I partially agree" ranked second at 25.3%. These were followed by “I strongly agree" with 19.8%, “I disagree” with 4.3% and “I strongly disagree” with .6%.

Item 6. The results of the 12th-grade chemistry course curriculum can be measured at the end of the lesson.

In Nigeria, the mean average of the teachers' opinions about this item is ($\bar{X}$ =1.84) and (SD=.94) standard deviation is seen. The other views of the teachers who participated in the form, "I strongly agree," ranked first with 43.1%, while “I agree" ranked second with 37.1%. These were followed by “I partially agree" with 13.4%, “I disagree” with 3.0% and “I strongly disagree” with 2.5%. In Türkiye, the mean average of the teachers' opinions about this item is ($\bar{X}$ =2.08) and (SD=.78) standard deviation is seen. The other opinions of the teachers who participated in the "I agree" form ranked first with 53.1%, while “I partially agree" ranked second with 21.6%. These were followed by “I strongly agree" with 21.6%, “I disagree” with 3.1% and “I strongly disagree” with .6%.

20. Qualitative Data Findings

Personal Information of 12-grade Chemistry Teachers in Nigeria

Personal information		*Nigeria*	*Türkiye*
		f	*f*
Gender	Male	4	4
	Female	1	0
Age	26-30	2	0
	31-35	2	1
	36-40	1	0
	41-45		2
Educational level	First degree	2	2
	MSc	2	1
	Ph.D.	1	0
Years of service	0-5	1	1
	6-10	2	1
	11-15	2	1

Table 4.13. The distribution of 5 teachers participating in the research from Nigeria based on gender, age, years of service, and education level

In Nigeria, according to the table above, 4 (80%) of the teachers participating in the interview in Nigeria are male, and 1 (20%) are female. The age of the teachers participating in the research was grouped as "26-30, 31-35, and 36-40". According to this, 2 (40%) of the teachers are between 26-30 years old, 2 (40%) are between 31-35 years old, and 1 of them (20%) is between 36-40 years old. 2 (40%) of the respondents were university graduates. The rate of those who have a master's degree is 2 (40%), and the rate of those who have a doctorate is 1 (20%). The years of service of the teachers who participated in the interview form in Nigeria were classified as "0-5, 6-10, and 11-15 years". According to this, 1 (20%) of the teachers have one year, 2 (40%) of them have between 6-10, and 2 (40%) of them have 11-15 years or more. **In Türkiye,** according to the table above, 3 (100%) teachers participating in the interview in Türkiye are male. The age of the teachers participating in the research was grouped as "26-30, 31-35, and 36-40". According to this, 1 out of the three teachers is between 31 and 35 years old, and two are between 41 and 45. Two of the respondents were university graduates. One of them is a master's degree holder. The years of service of the teachers who participated in the interview form in Türkiye were classified as "0-5, 6-10, and 11-15 years". According to this, 1 of the teachers has between 0-5, 1 of them has between 6-10, and the other 1 has 11-15 years or more.

➢ Teachers' Views on Content Dimension in Nigeria and Türkiye

The **first** question asked to the teachers about the context dimension is, *"Do you think that the program's objectives are achievable?*

In Nigeria, the teachers have different views on the program's aim. Some excerpts from the statements of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described their ideas are as follows:

NT1: *"Yes, they are achievable because the objectives are clearly stated and have been broken into simpler ways, which enable students to understand the subject easily."* **NT2***: "In my opinion, the objectives of SSS3 chemistry are partially achievable because not all the topics are understandable by the students".*

NT3: *"Yes, they are achievable because they are built in such a way that we teach step by step as a pre-requisite of which they are expected to understand easily."*

NT4: *"Yes, the objectives are achievable as they are designed for our national education system in Nigeria. Based on the time allocated for the syllabus, the time is enough and enables us to achieve the stated objectives".*

NT5: *"The objectives are not, or let me say they are partially achieved because when we look at the overall secondary school objectives in Nigeria, there are two. 1. To prepare students for tertiary education and 2. Those who cannot go for tertiary education should be able to fit into society and positively contribute to society's economy. However, what we have today, most students who finished secondary school cannot contribute anything to society. Therefore, the overall objectives are not achieved".*

Based on the opinions of the teachers who participated in the interview, four believed that the objectives were achievable. However, contrary to their views, one participant thought the goals could be more possible. This finding aligns with the quantitative determination of this sub- dimension in which most participants stated that they "agree" when the same question was asked. **In Türkiye,** the excerpts from the statements of the teachers with the code (TT1, TT2, and TT3) who described their views are as follows:

TT1: *"Now, in this regard, I can conclude that almost half of the student's potential has been reached, and half of it has not. Because not every student can get what they want to achieve. In other words, each student's learning is different and that's how it goes accordingly. So, I'd say partially.*

TT2: *" Yes, because there is enough course material."*

TT3: *"Yes, I think because there is enough material and time."*

Based on the above responses, the participants' opinions show that the program's objectives are achievable, except for 1 participant who believes the goals are partially achievable. The **second** question was, *"Do you think the objectives have been stated clearly"?*

In Nigeria, the excerpts from the opinions of the teachers regarding this question with the code (NT1, NT2, NT3, NT4, and NT5) who described their views are as follows:
NT5: *"Yes, they are clearly stated".*
NT1: "*Yes, because the objectives have been stated properly and there is no ambiguity".*
NT4: *"Yes, because those who prepared the curriculum use the content designed by the Nigerian Educational Research and Development Council (NERDC)".*
NT2: *"Yes, in my opinion, they are well stated".*
NT3: *"Yes, they are well stated. As a teacher, when I go through the objectives, it helps me outline a particular topic I will teach. İts also focuses on the point where I should put more effort when teaching".*
Therefore, based on the opinions of the teachers who participated in this interview, 5 (100%) believed that the objectives of the 12th-grade chemistry had been clearly stated. Similar findings were obtained in the quantitative analysis of the research in which most participants partially agreed and agreed with the clarity of the objectives.

In Türkiye, the excerpts from the opinions of the teachers regarding this question with the code (TT1, TT2, and TT3) who described their views are as follows:
TT1: *"So, let us say partially."*
TT2: *"Yes, because everything has been stated."*
TT3: *"Yes, everything has already been stated."*
Therefore, based on the opinions of the teachers who participated in this interview, they all believed that the objectives of the 12th-grade chemistry had been clearly stated. Similar findings were obtained in the quantitative analysis of the research in which the majority of the participants partially agreed or agreed with the clarity of the objectives. The **third** question asked was, *"What is your opinion on the consistency of the objectives in the program with each other"?* The excerpts from the opinions of the teachers regarding this question with the code (NT1, NT2, NT3, NT4, and NT5) who described their views are as follows:

NT3: *"They are consistent whereby they go hand-in-hand with each other.*
NT5: *"Yes, they are consistent because the 12th-grade chemistry curriculum contents and even some textbooks are arranged so that lesson 1 will provide the foundation for lesson 2 and lesson 2 provide understanding for lesson 3.*
NT2: *"Some of them are consistent."*
NT4: *"Some are consistent with each other".*
NT1: *"I believe they are consistent with each other because they have been taken from a well-organized curriculum".*

In this regard, all the participants believed that the objectives were consistent.
In Türkiye, the excerpts from the opinions of the teachers regarding this question with the code (TT1, TT2, and TT3) who described their views in Turkish are as follows:
TT1: *"Let me say that it is still partially related to it. Partially it doesn't. Sometimes there are conflicting situations. I have half an idea like this in this one, so that's what I understand.*
TT2: *"I think it is consistent."*
TT3: *"I can say it is consistent."*
The above responses show that the program's objectives are consistent except for one participant who believes they are partially compatible. The **fourth** question was, *"Do you think that the program's outcomes are like helping students reach general goals?"* The excerpts from the opinions of the teachers regarding this question with the code (NT1, NT2, NT3, NT4, and NT5) who described their views are as follows:
NT1: *"I believe that the outcomes are in the nature of helping students reach their goals because this program is designed by experts from the Nigerian Educational Research and Development Council (NERDC)".*
NT4: *"I can say yes because we as teachers are taking our time to see that all students reach their general goals".*
NT2: *"Yes, they are partially helping the students reach their general goals".*
NT5: "*Yes, they are, but the problem with the chemistry curriculum is that it is preparing students for industries. Therefore, students can not fit into society and use local materials to solve societal issues.*
NT3: *"Yes, I can say they do help."*

The above responses from the participants show that the outcomes of the 12th-grade chemistry program are like helping the students reach their goals.

In Türkiye, the excerpts from the opinions of the teachers regarding this question with the code (TT1, TT2 and TT3) who described their views are as follows:
TT1: *"Now let me answer like this. Normally, what you want to give and what you want to receive may not match exactly. For this too. How can I say, Again I can say that it helps partially?"*
TT2: *"Yes, it helps."*
TT3: *"Yes, I think it helps."*

The above responses from the participants show that the outcomes of the 12th-grade chemistry program in Türkiye are in the nature of helping the students reach their goals. However, one of the respondents partially believed that the program's outcomes are in the nature of assisting students to reach general goals.

The **fifth** question was, *"What are your opinions on the theoretical information in the 12th- grade chemistry program?"* The excerpts from the opinions of the teachers regarding this question with the code (NT1, NT2, NT3, NT4, and NT5) who described their views are as follows:

NT3: *"The theoretical information in the program is standard and helps students understand the topics in the chemistry textbooks".*
NT5: *"In my opinion, the theoretical information is relevant and adequate".*
NT2: *"The information is excellent and relevant for teachers and students".*
NT1: *"I believe the theoretical information is good and practicelike. It will help students understand the contents very well".*
NT4: *"Based on the other curriculum I have checked, our 12th-grade chemistry curriculum should be reviewed and improved".*

In this respect, the analysis of the participants' responses shows that they all believed the theoretical information in the 12th-grade chemistry program was relevant and adequate. This

finding agrees with the quantitative results of this research, where 37.6% of teachers agree that the information is relevant.

In Türkiye, the excerpts from the opinions of the 12th-grade chemistry teachers in Türkiye regarding this question with the code (TT1, TT2 and TT3) described their views as follows:

TT1: *"General, we have a program prepared by the professors. In the 12th grade, especially in terms of electrochemistry, and organic chemistry, how can I say, its application? In other words, since there are theoretical parts, for example, there are parts that the student can or cannot take. So, it would be better if we developed this a little more in a more modern sense."*

TT2: *"I don't think it's enough at all."*
TT3: *"It's not enough."*

In this aspect, the analysis of the participants' responses shows that they all believed the theoretical information in the 12th-grade chemistry program was enough and needed improvement. These findings contradict the quantitative results of this research, where 46.3% of teachers agree that the information is relevant.

➢ Teachers' Views on Input Dimension in Nigeria and Türkiye

Five questions were asked to the teachers regarding the input dimension.

The **first** question asked to the teachers about the input dimension is, *"Do you think the information contained in the program contents is understandable?".*

In Nigeria, the teachers stated their opinions with different views, and some excerpts from the statements of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described the input dimension are as follows;
NT5: *No, one of the education problems in Nigeria is the language of instruction, and most students need a mastery of the language. A secondary school student needs help to pick a chemistry textbook to read and understand the book's contents. The structures, examples, and illustrations are far from the local community.*
NT3: *"Yes, they understand and cleared".*
NT2: *"I can say they are partially understandable because some of the contents are difficult to understand due to the nature of illustrations and examples."*
NT4: *"Yes, the contents are understandable".*
NT1: *"I believe that the contents are understandable because the contents are broken down in such a way that can be assimilated by the students easily."*

The teachers who participated in this aspect have different opinions regarding the contents of the program. Some of them believed that the contents could have been more understandable due to the language of instruction, while some thought that the contents were clearly stated. Therefore, they are easy to understand.

In Türkiye, the excerpts from their thoughts with the code (TT1, TT2 and TT3) described the input dimension as follows;
TT1: *"I think it's pretty clear, especially when you check it out in your chemistry book. Our books have a simple explanation."*
TT2: *"Yes, because it is explained in simple language."*
TT3: *"es, it is explained in only one language."*

The teachers who participated in this aspect have the same opinions regarding the contents of the program. They are of the view that the contents are clearly stated. Therefore, it is easy to understand.
The **second** question asked the teachers about the input dimension is, *"Do you think the topics in the textbook are consistent with the program's achievements?".*

In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described the input dimension are as follows;
NT5: *"Yes, they are consistent and adequate".*
NT3: *"Yes, they are consistent because it gives students an insight into chemistry and how it relates to our lives".*
NT2: *"Yes, I can say. They are partially consistent because some topics are well explained while others are not."*
NT4: *"Yes, some of the contents are consistent with the achievements while some are not".*
NT1: *"Yes, they are consistent with the achievement."*
All the participants in this context believed that the topics in the textbook were consistent with the program's achievements in general. When a similar question was asked in the quantitative part

of the study, the majority of the teachers responded with "I agree," which shows that they are consistent with the achievement of the program.

In Türkiye, the excerpts from the opinions of the 12th-grade chemistry teachers in Türkiye with the code (TT1, TT2 and TT3) described the input dimension as follows;
TT2: *"Yes, I think it's consistent."*
TT1: *"In the same way, I see this consistency in the books. So, there are no such irrelevant things."*

TT3: *"It is consistent."*
All the participants in this context believed that the topics in the textbook were consistent with the program's achievements in general. When a similar question was asked in the quantitative part of the study, the majority of the teachers responded with *"I agree,"* which shows that they are consistent with the achievement of the program.

The **third** question asked to the teachers about the input dimension is, *"In your opinion, does the textbook have a structure that will encourage students to learn?"*.

In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described the input dimension are as follows;

NT1: *"Yes, most of the textbooks we used in the 12th-grade chemistry program have good structures that encourage students to learn chemistry as a career subject." NT4: "Yes, some of the textbooks have good structure"*.
NT2: *"Yes, they are well structured, encouraging students to learn chemistry"*.
NT3: *"Yes, the structures of the textbooks we used are significant and give students the courage to put more effort into learning chemistry. It also helps students to master and recall what they have learned whenever they come across them in real life."*
NT5: *"Yes, some textbooks are encouraging. Example, New School Chemistry Textbook, etc."*
In response to the third question, all the teachers who participated in this study believed that the textbooks they used in the 12th-grade chemistry program have suitable structures that encourage students to learn chemistry."

In Türkiye, the excerpts from the opinions of the 12th-grade chemistry teachers in Türkiye with the code (TT1, NT2 and TT3) described the input dimension as follows;
TT1: *"So this way. Especially in recent years, a simpler and more understandable book has begun to be prepared. In previous years, there were times when it was too complex or when the student opened it and there was more such writing. But in recent years, I think that the visual has become more and it has increased such fluency more.*
TT2: *"Yes enough, because there are explanations.*
TT3: *"Yes, there are enough explanations."*
In response to the third question, all the teachers who participated in this study believed that the textbooks they used in the 12th-grade chemistry program have suitable structures and explanations that encourage students to learn chemistry. "The **fourth** question asked to the teachers about the input dimension is, *"Do you think that the program is prepared according to the level of pre-knowledge and skill required for students to understand the subject?"*. **In Nigeria**, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described the input dimension are as follows;

NT5: *"No, because chemistry is conceived as a complicated subject and an abstract subject by students, and you know it is challenging to teach an abstract subject"*.

NT2: *"It is partially prepared according to pre-knowledge and skills required for students to understand the subject. This is because most students believe that chemistry is a complicated subject, making it difficult for them to understand it as required."*
NT4*: "Yes, they are prepared according to pre-knowledge and skills required for students to understand the subject, and we as teachers were taught how to implement the curriculum effectively."*

NT1: *"Yes, they are prepared according to pre-knowledge and skills required for students to understand the subject"*.

NT3: *"Yes, they are"*.

In response to the fourth question, almost all the teachers who participated in this study believed that the program is prepared according to the level of pre-knowledge and skill required for students to understand the subject. However, one of the participants has a contrary view about the pre-knowledge and skill of the students. He believed that the nature of chemistry as a subject and the students' perceptions make it difficult to implement the program effectively. **In Türkiye**, the excerpts from the opinions of the 12th-grade chemistry teachers in Türkiye with the code (TT1, TT2 and TT3) described the input dimension as follows;

TT1: *"There are some short information including short information in the topics, so I think that it is prepared even though it is not very sufficient. But it's not 100% like that, it's around 60%."*
TT3: *"I think partially."*
TT2: *"Partially."*

In response to the fourth question, almost all the teachers who participated in this study believed that the program is partially prepared according to the level of pre-knowledge and skill required for students to understand the subject.
The **fifth** question asked the teachers about the input dimension is, *"What is your opinion on the topics available in the chemistry program you used?"*. **In Nigeria**, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who described the input dimension are as follows;

NT3: "*In my opinion, the topics are relevant, simple, and mostly easy to understand.*" **NT1***: "I think the topics are good and relevant, especially to the classes I teach.*" **NT2***: "I believe the topics are relevant, but some are complicated, discouraging some students from picking an interest in chemistry."*

NT4: *"Because I like chemistry, the topics are clear and easy."*

NT5: *"The topics are okay. However, the topics should be written in simpler language because some topics are difficult for students to understand due to the language of instruction".*

In response to the fifth question in the input dimension, almost all the participants believed that the topics were relevant and accessible for the students to understand. However, one participant (NT5) pointed out that the language of instruction in the program makes some topics difficult. Therefore, it should be written in simple language to make it easier for students to understand. **In Türkiye,** the excerpts from the opinions of the 12th-grade chemistry teachers in Türkiye with the code (TT1, TT2 and TT3) described the input dimension as follows;

TT1: *"As I said, there are electrochemistry and organic chemistry in the 12th grade curriculum. It might be a bit heavy for students. Especially organic chemistry contains very verbal parts. However, in our country, it is only a so-called laboratory-based thing. So, it develops on such words. I can say that it is not exactly like that."*

TT2: *"It could have been a little more remarkable".*

TT3: *"It could have been a little more remarkable."*

In response to the fifth question in the input dimension, almost all the participants believed that the topics could have been easier for the students to understand.

Teachers' Views on the Process Dimension in Nigeria

Five questions were asked to the teachers regarding the process dimension.

The **first** question asked to the teachers about the process dimension is, *"What are your views on the effectiveness of the methods used in the program?"*. **In Nigeria**, the teachers stated their opinions with different views. Some excerpts from the statements of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT5: *"We mostly use lecture or traditional methods of teaching. The reason is not far from the absence or shortage of laboratory equipment; in this case, students have minimal contribution to make during the teaching-learning process."*

NT4: *"In my opinion, the illustration method is more effective. This is because teachers can use a lot of diagrams, pictures, and other visual materials to explain the lesson effectively".*

NT3: *"We use teacher-center and interactive methods, but mostly interactive methods. This is because we interact with students for better understanding. I believe the interactive method is more effective."*

NT2: *"In my opinion, the methods used are very effective, especially the interactive method, which allows teachers and students to interact and contribute during the teaching-learning process".*

NT1: *"I believe the methods are very effective, especially interactive because it allows students to interact with themselves and the teacher for better understanding".*

In response to the first question in the process dimension of this research, all the participants stated that the methods used in the 12th-grade chemistry program are very effective. They noted that the interactive method is more effective than the others because it allows them to interact with students and contribute during the teaching-learning process. **In Türkiye**, excerpts from the statements of the teachers with the code (TT1, TT2 and TT3) who responded to questions on the process dimension are as follows;

TT1: *"I work as a teacher because I work here completely in the classroom. What the teacher says and what the student gets is important. In other words, we do not do anything for detailed methods, as we give information on the exams rather than the things that need to be given in the school. So, we are not entering".*

TT2: *"It could have used different methods that would involve the student in the event."*

TT3: *"Could have used different methods to involve the student".*

In response to the first question in the process dimension of this research, all the participants stated that the methods used in the 12th-grade chemistry program could have been more effective.

The **second** question asked to the teachers about the process dimension is, *"Do you think the implementation program ensures that what is learned is transferred to daily life?".*

In Nigeria, the teachers stated their opinions with different views. The excerpts from the statements of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT5: *"As I said, the chemistry program/contents prepare students for industrial operation rather than to fit into society and solve societal problems".*

NT4: *"I think yes. Because many students can do something independently after secondary education".*

NT3: *"Yes, in my opinion, they transferred to daily life".*

NT2: *"I can say partially because not all students can solve some societal program after secondary education. However, some of the students do so."*

NT1: *"Yes, of course, this is what we as teachers emphasise, and*

that is how we understand what has been learned is transferred to daily life".

In response to the second question in the process dimension of this research, some participants stated that the implementation process of the 12th-grade chemistry program ensures that what is learned is transferred to daily life. However, one participant said they only achieve sometimes. Some students can use what they learned from chemistry in daily life effectively. A similar finding was found in the quantitative part of the study, where 42.6% of the participants agreed that the implementation process ensures that what is learned is transferred to daily life. **In Türkiye**, the excerpts from the statements of the teachers with the code (TT1, TT2 and TT3) who responded to questions on the process dimension are as follows;

TT1: *"So this way. Again, I can give the same answer regarding the first question and the previous one. Because, as a classroom, we do not look at the flow of things related to daily life, since we are preparing directly for the exam. In other words, it does not question what the student is doing outside. Since it is directly aimed at the exam, it follows this way".*
TT2: *"Partially reflects, although not fully".*
TT3: *"Partially reflects, although not fully."*

In response to the second question in the process dimension of this research, some participants stated that the implementation process of the 12th-grade chemistry program ensures that even though not fully but partially, what is learned is transferred to daily life. However, one of the participants stated that only sometimes, did they achieve this because they mostly focused on exams. A similar finding was found in the quantitative part of the study, where 45.7% of the participants agreed that the implementation process ensures that what is learned is transferred to daily life.

The **third** question asked to the teachers about the process dimension is, *"What are your views on the compatibility of the methods in the program with the objectives and content of the program?".* The teachers stated their opinions with different views. **In Nigeria**, the excerpts from the statements of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT1: *"I believe the methods used in the chemistry programs are compatible with the objectives/contents of the program as it helps students understand the objective of the program in general."*
NT2: *"In my opinion, some of the methods are compatible. Sometimes, we teachers found it difficult to implement the program effectively due to the non-compatibility of the methods specified in the program."*
NT3: "*Yes, I think they are compatible with the program/contents."*
NT4: *"Yes, the methods are compatible with the program/contents."*
NT5: "*Not really. Because as I said, the objectives are teaching students to develop skills, and there is no way skill can be imbibed if the students do not come in contact with the facilities in the laboratories. The chemistry objectives encourage learning by doing, but because there are not enough facilities, the methods are incompatible with the contents."*

In response to the third question in the process dimension of this research, three out of five participants stated that methods used in the 12th-grade chemistry program are compatible with the contents. However, one of the participants said that only some of the methods are compatible because methods are not suitable for specific contents in the program. While one of the participants believed that methods are not consistent at all, this is because there is a lack of enough facilities in the laboratories where students are supposed to learn by doing some practical of what they have learned in the class.

In Türkiye, the excerpts from the statements of the teachers with the code (TT1, TT2, and TT3) who responded to the third question on the process dimension are as follows;

TT1: *"Because I don't know much about it. Here's what I should say. Unfortunately, we do not go into such details as we offer exam-oriented teaching as a private course."*
TT2: *"Purpose and content are compatible with each other."*
TT3: *"Purpose and content are compatible with each other."*

In response to the third question in this research's process dimension, two participants stated that methods used in the 12th-grade chemistry program are compatible with the contents. The **fourth** question asked the teachers about the process dimension is, *"Is the program suitable for you to engage your students in collaborative activities during the chemistry program?".* **In Nigeria**, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT5: *"No, as I said, chemistry as a subject is abstract. So, it is difficult to group students and allow them to work or perform practical alone."*
NT4: *"Yes, in my opinion, the program is suitable for engaging students in collaborative activities such as projects and practicals."*
NT3: "Yes, they are suitable for collaborative activities."
NT2: *"Yes, but not all the content programs are suitable for engaging students in collaborative activities. This is because some topics are abstract; therefore, engaging students in collaborative activities without teacher's supervision can be difficult."*
NT1: *"Yes, they are suitable for collaborative activities".*

In response to the **fourth** question in the process dimension of this research, three out of five of the participants stated that the 12th-grade chemistry program is suitable for you to engage your students in collaborative activities during the chemistry program. Two participants believed it takes more work to engage students in joint activities due to the nature of chemistry in general. **In Türkiye,** the excerpts from the opinions of the teachers with the

code (TT1, TT2 and TT3) who responded to questions on the process dimension are as follows;
TT1: *"No, there is only a one-to-one question-and-answer style in class. We won't go into too much detail, we can't interact. Because time is limited."*
TT2: *"It's suitable."*
TT3: *"Not suitable."*

In response to the fourth question in the process dimension of this research, one out of three participants stated that the 12th-grade chemistry program is suitable for engaging students in collaborative activities during the chemistry program. Two participants believed engaging students in joint activities is inappropriate due to time constraints. The **fifth** question asked to the teachers about the process dimension is, *"Is the program suitable for you to apply the peer evaluation form in the evaluation of your program?"*. **In Nigeria,** the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;
NT5; *"Yes, the program is suitable for applying a peer evaluation, but it is not done."*
NT3: *"Yes, it is suitable because there is an evaluation at the end of every lesson in the program".*
NT4: *"Yes, it is suitable for me to apply for a peer evaluation form at the end of the program."*
NT2: *"Yes, it is suitable."*
NT1: *"In my opinion, the program is suitable for applying peer evaluation form."*
In response to the **fifth** question in the process dimension of this research, all five participants stated that the 12th-grade chemistry program is suitable for applying the peer evaluation form at the end of the program. **In Türkiye,** the excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"Since the students I address are generally older, there is not such a suitable environment for this at the high school level."*
TT2:*" I think it partially allows."*
TT3: *"it partially allows."*

In response to the **fifth** question in the process dimension of this research, all participants stated that the 12th-grade chemistry program is partially suitable for applying the peer evaluation form at the end of the program.

➢ Teachers' Views on Product Dimension in Nigeria

Five questions were asked to the teachers regarding the product dimension
The **first** question asked to the teachers about the product dimension is, *"What do you think about the validity and reliability of the measurement-evaluation tools in the program?"*.
In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;
NT1: *"I think the measurement instruments are valid and reliable".*
NT2: *"In my opinion, they are valid and reliable because they give me the information on the level of students' understanding."*
NT3: *"Yes, they are valid, reliable and effective for the evaluation process."*
NT4: *"Yes, I believe they are reliable and effective."*
NT5: *"No, because most evaluation tools are largely teacher-made."*

In response to the first question in the product dimension of this research, four out of five participants stated that the evaluation tools in the program are reliable, relevant, and effective. However, one of the participants with the contrary view believed that the evaluation tools could be more reliable because the tools are mostly made by teachers. The excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"Since our aim is the TYT and AYT exams, whose desired result is realized or will take place, in the exams we will do, how can I say, whether it is a written paper or a test. Since there are not many such things, we just distribute the test and check it. That's what I'm going to say about it. So, we can't get into the official dimension so much. Yes, we do not have such written feedback. Fast speed against time. If so, we look at how it solves a question, how it is done. Again, there is no way back."*

TT2: *"I find it sufficient."*
TT3: *"I find it sufficient."*

In response to the first question in the product dimension of this research, two out of three participants stated that the evaluation tools in the program are sufficient. However, one of the participants with the contrary view said that they are not into the evaluation tools as much. The **second** question asked to the teachers about the product dimension is, *"Are you satisfied with the tools used in the evaluation of the program?"*.

In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;
NT5: *"No, I am not satisfied with tools at all. This is because most tools are teacher- made, which is not standard. The evaluation tools should be standard instruments, which should be used to evaluate teacher's competency and those who covered/not covered contents within the specified period."*
NT4: *"Yes, I am delighted with the evaluation tools used in this program." NT3: "Yes, I am satisfied with the tools we used in the evaluation process."*
NT2: *"Yes, I am delighted with most of the tools we use in the program."*
NT1: *"Yes, I am well satisfied with the tools."*

In response to the second question in the product dimension of this research, all the are satisfied with the evaluation tools. However, one participant stated that the evaluation tools should be

standard which could evaluate not only students but also teachers' competence. In Türkiye, the excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"In this way, I usually only see it from there and from the letter or something. We do not make much use of the model in the presentation. Because as I said. Just because there are not many such tools related to it."*
TT2: *"Yes, it seems sufficient."*
TT3: *"Yes, I am satisfied, and it seems sufficient."*

In response to the second question in the product dimension of this research, two of the participants are satisfied with the evaluation tools. However, one of the participants believes that the evaluation tools should be used more. The **third** question asked the teachers about the product dimension is, *"What is your opinion on the student's achievement level at the end of the program?"*.

In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT1: *"In my opinion, the student's level of achievement is encouraging even though some of the students do not do well at the end of the program."*
NT2: *"I believe that the student's level of achievement is average."*
NT3: *"For me, the student's level of achievement is positive and considerable."*
NT4: *"The student's achievement is generally average."*
NT5: *"In my opinion, the level of achievement is average. As I said earlier, students cannot independently perform some experiments at the end of the program. That means the overall achievement is not achieved."*

In response to the third question in the product dimension of this research, two out of five participants stated that the student's level of achievement is positive and encouraging. However, two of the participants believed that the student's level of achievement is generally average due to the preconception of students that the subject is complex. **In Türkiye**, the excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"The most important level for us is as follows. The percentage of achievement in the exam is good. We act according to the student's exam result. According to the TYT and AYT exams held at the end of the year, did they go to a job or a good department or win the university? We determine the level of success accordingly."*
TT2: *"I think it's not at a sufficient level."*
TT3: *"Not at a sufficient level."*

In response to the third question in the product dimension of this research, two out of the participants stated that the student's level of achievement could be a different story. However, one of the participants believed that the student's level of achievement is generally at a reasonable level.

The **fourth** question asked the teachers about the product dimension is, *"Do you think students' attitudes towards chemistry changed positively at the end of the program?"*.

In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT5: *"In my opinion, there is no significant change because students enter the class with the preconception that the subject is difficult, and there is little effort by the teachers to change that preconception."*
NT4: *"There is little change."*
NT3: *"Yes, there is positive change at the of the program"*.
NT2: *"In my opinion, some of the students who picked interest during the learning process have positive change at the end of the program."*
NT1: *"Yes, of course, it changes because of the motivation we give students while implementing the program; most students always want to learn more about chemistry."*

In response to the fourth question in the product dimension of this research, two out of five participants stated that the student's attitude toward learning chemistry positively changes at the end of the program. However, one of the participants believed that the student's attitude toward learning chemistry is averagely altered due to the perception of some students that the subject is complex.

In Türkiye, the excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"Especially here, there is a positive change in the attitudes of those who are interested in the course. Unfortunately, that negativity continues in those who are so indifferent to the lesson. But we are doing our best in it. We aim to increase their interest in the course as much as possible."*
TT2: *"Yes, their attitudes changes."*
TT3: *"Yes, their attitudes changes."*

In response to the fourth question in this research's product dimension, all participants stated that the student's attitude toward learning chemistry positively changes at the end of the program. The **fifth** question asked the teachers about the product dimension is, *"Do you think students' success reaches the desired level at the end of the program?"*. In Nigeria, the excerpts from the opinions of the teachers with the code (NT1, NT2, NT3, NT4, and NT5) who responded to questions on the process dimension are as follows;

NT1: *"Yes, I think the student's success reaches the desired level even though not all the time and classes. Therefore, I can say partially reached the desired level at the end of the program."*

NT2: *"In my opinion, they partially reach the desired level."*
NT3: *"I can, yes".*
NT4: *"Yes, the success reaches the desired level."*
NT5: *"Not really, because most students cannot fit into society and solve societal problems after secondary education. Most students go for tertiary education or wait for industries to employ them, which is Nigeria's major problem of chemistry programs."*

In response to the fifth question in the product dimension of this research, four out of five participants stated that the student's success reached the desired level at the end of the program. However, one of the participants believed that the student's success did not reach the desired level.

In Türkiye, the excerpts from the opinions of the teachers with the code (TT1, TT2 and TT3) responded to questions on the process dimension as follows;

TT1: *"Even though we have not achieved 100% success in the figure, we see that it has reached the level we want in general, not 100%, for example. So, the feedback shows that too."*
TT2: *"No, they don't show the necessary dedication."*
TT3: *"No, because they don't show the necessary dedication.*

Discussion

In this section, the discussion, conclusions and recommendations reached in line with the findings obtained in the research are discussed below.

Discussion and comparison of the general objectives of the 12th-grade chemistry course curriculum in Türkiye and Nigeria.

The chemistry curriculum, which was last updated in 2018 in Türkiye, aims to provide an integrated curriculum around other disciplines and daily life skills, values, and competencies, which encourages students' use of metacognitive skills, connects them with solid and previous learning, and provides meaningful and permanent education. (MEB, Science Curriculum, 2018). The objectives of the chemistry curriculum in Nigeria, as revised by the Nigerian Educational Research and Development Council (NERDC), were aimed at developing students' interest in the subject of chemistry, science, technology and mathematics (STM) knowledge and skills. Also, applying skills to meet societal needs creates employment and wealth (NERDC, 2007). Now, based on the literature that was reviewed in this study, it can be seen that both Türkiye and Nigeria have aimed at facilitating a smooth process in the use of science concepts with techniques to be acquired as far from the new basic science technology, engineering and mathematics (STEM). For this reason, various teaching methods and techniques, teaching materials and learning environments supporting the objectives of the 12th-grade chemistry curriculum are used. As stated by Erden (1999), in his curriculum evaluation, he said that while selecting the teaching methods and techniques, goals or achievements, characteristics of students and teachers, content, and available opportunities should be considered.
In Türkiye, many changes have been made in the chemistry curriculum from (1930- 2007) to the republic to the present Diyaddin & Mustafa (2014). These changes have made science, technology and mathematics (STM) an enamour road for new skills in the chemistry curriculum's infrastructure. Similarly, in Nigeria, the chemistry curriculum adopted twentieth- century skills and integration of STM standards into the learning process, realising the principle of complementarity with other branches, especially physics, biology, and geography, which are termed as pure and applied sciences, and other Art courses ensures meaningful and permanent learning, with the latest approaches in the performance evaluation. Looking at the aims and objectives of the chemistry curriculum, it can be seen that there is no significant difference between Türkiye and Nigeria in terms of the objectives of the 12th-grade chemistry curriculum. At this point, the teachers in Türkiye and Nigeria participating in both the qualitative and quantitative part of this research also stated that the objectives in the curriculums were suitable for 12th-grade students, and the characteristics of the subject area and the objectives in both countries were consistent. From this point of view, it can be said that the objectives of the 12th-grade chemistry curriculums were sufficient, clear and understandable in both countries. These findings are in line with a similar study conducted by Anil & Oğuz Er (2014) titled Ortaöğretim 10. Sınıf kimya dersi öğretim curriculumının değerlendirilmesi. They stated that according to teachers' opinions, the general objectives in the Secondary Education 10th Grade Chemistry Course Curriculum are not only complementary and supporting each other, but also expressed in an understandable language.

The content, input, process and product dimensions were evaluated within the scope of the 12th-grade chemistry evaluation based on the CIPP evaluation model. Based on the results obtained from both Türkiye and Nigeria, to answer the aims of this study, it is considered essential to discuss the critical findings of all the dimensions one by one while comparing the results between the two countries.

Discussion on the Content Dimension

In the context dimension, it is seen that most of the teachers in Nigeria who participated in the first item of the sub-dimension questionnaire have positive views and agree with the clarity of the objectives. However, in the qualitative part of the study, some participants from Nigeria believed that the goals needed to be more stated. As mentioned above, the goals of the chemistry curriculum are expected to be clearer and more precise to enable students to comprehend what they were taught. Similarly, an evaluation of the chemistry curriculum by Abidoye [30]. stated that incorporating additional goals to promote critical thinking, hypothesis and theory development, and scientific knowledge application among students would aid in fulfilling the recommendations of the guided discovery strategy. This finding aligns with the quantitative result of this sub-dimension in which most participants believed that the objectives need to be clear. In Türkiye, it can be seen that the majority of the teachers who participated in the questionnaire and qualitative part of this study are of the view that the general objectives of

the chemistry curriculum are partially stated. These findings are in line with the result of a similar study by Kurt & Yıldırım [31]. However, some believe that the objectives are clearly stated and all the materials required for the teaching and learning process are available. From this point of view, it can be said that most teachers from both countries have a positive perception of this dimension. In the second sub-dimension, most teachers who expressed their opinions in Nigeria believe that the objectives are attainable. However, two participants stated that the objectives were not or partially achievable in the qualitative part of the study. This is because the education system does not fully provide what is needed to transfer knowledge to students. In Türkiye, most participants stated that the objectives are attainable while some are neural in this aspect. This shows that most participants from both countries have the same opinion. In Türkiye, most of the participants in the qualitative part agreed that objectives are achievable. In the fourth sub-dimension, in Nigeria, most of the participants are of the view that the topics and time allocated are compatible with each other. At the same time, some participants neither agree nor disagree, while very few have negative opinions about the compatibility of topics and time allocated in the curriculum. Seçken & Kunduz [32]. Found similar results in their study. While in Türkiye, it can be seen that most of the participants also believe that the issues and time given are compatible.

In the fifth sub-dimension, participants from Nigeria agreed that the curriculum's outcomes were clearly stated. Just a few of the participants disagreed with the clarity of the outcomes. In Türkiye, a similar percentage as in Nigeria, most participants agreed that the outcomes are clearly stated. From this point of view, it can be seen that there is no significant difference between the two countries. In the sixth sub-dimension, most teachers from Nigeria have positive opinions about this sub-dimension. However, some of the participants have opposing opinions. Similar views were observed from the teachers who participated in the qualitative part of the study. In Türkiye, almost 70% of the participants believed that the theoretical information contained in the curriculum was sufficient. However, contrary to quantitative findings, two participants expressed their opinions while responding to the interview, believing the information was insufficient. From this point of view, the theoretical knowledge in the 12th-grade chemistry curriculum can be considered sufficient in Nigeria but not in Türkiye.

Discussion on the Input Dimension

In the input dimension, most of the teachers from Nigeria who participated in the first sub-dimension questionnaire believe that texts and lessons are remarkable. Similarly, in Türkiye, most participants agreed that the textbooks and classes are great for students. From this point of view, it can be said that teachers have a positive perception of this dimension. The fact that the rate of teachers expressing their opinions at the level of "I partially agree" is high in both countries indicates a positive perception toward improving educational inputs. In addition, some of the participating teachers from both Türkiye and Nigeria in the second sub- dimension have positive responses about the student's prior knowledge and skill levels to implement the 12th-grade chemistry curriculum. However, almost 20% of the participants from Türkiye have disagreed. In the third sub-dimension of the input, most of the participants from both countries have expressed positive opinions. However, most of the participants from Türkiye agreed with the textbooks' structure. There is a considerable number of participants who disagreed.

The reason was revealed from an interview done with some teachers from Türkiye; it was revealed that all three participants expressed positive, which means that the textbook has a structure that will encourage students to learn chemistry. Similarly, the remaining 17.5% of participants from Nigeria also expressed negative opinions on the design of the textbooks that do not encourage students to learn chemistry as a subject. In the fourth sub-dimension, the analysis of the data collected from participants in Nigeria shows that the textbook facilitates the realization of the gains. However, few of the responses from Nigeria have opposing opinions on this aspect. In Türkiye, it has been determined that there is diversity in the views regarding the textbooks used in 12th-grade chemistry. Some teachers believed there was a shortage of information in the books used. Some of the teachers from Nigeria stated that topics are easy but should be written in a more straightforward language, which could be easy and facilitate smooth learning for students. In the fifth sub-dimension, it has been revealed that most teachers from Nigeria believed that the topics in the textbook were consistent with the achievements of the course in the curriculum. However, many participants have opposing opinions on the consistency of the textbooks and the student's achievements in the course. This could be due to the language used and how some textbook topics are explained, lack of interest by students, insufficient teaching-learning infrastructures, and an overload of the subject contents for the student's level. Similarly, Kurt & Yıldırım (2010), in their study, state that teachers listed these problems as the content not attracting the attention of the students, insufficient course duration, the content not being suitable for the students' levels, the abundance of memorization-based subjects, and the weakness of the student's mathematical and abstract thinking competencies. While in Türkiye, most of the teachers who participated in the study believed that topics available in textbooks are consistent with the achievements of the subject of chemistry.

Similarly, in an interview conducted with some teachers in Türkiye, it can be seen that some teachers stated that the topics are heavier, which negatively affects the achievements in the subject. Especially in organic chemistry, there are many theoretical or verbal parts in the textbook. Possible reasons could be the lack of laboratories in the schools. Another reason is that the information or the explanation of the topics is not enough, as stated by some teachers from Türkiye. A similar study conducted by Seçken & Kunduz (2013) states that as a result of the interviews with the teachers who participated in the study, the most difficult subjects in 9th-grade chemistry were, "naming of compounds, basic laws of chemistry, organic compounds, names and discoveries of scientists

who contributed to alchemy, chemical bonds, polymers, solubility, % problems and chemistry in our lives" respectively. From this point of view, it can be said that some of the topics in the chemistry textbooks are difficult in both countries. Looking at similar studies aimed at evaluating chemistry curriculums, it is seen that there are similarities with the findings in this present study. Yadigaroğlu & Demircioğlu (2012) in their evaluation of the 9th-grade chemistry curriculum stated that the topics in the new curriculum were too loaded compared to the time allocated for each content and teachers found it difficult to cover the topics within the stipulated time. These textbooks could have been developed in a modern way that could help students understand the subject of chemistry in a better way [33].

Discussion on the Process Dimension

In the process dimension, according to the teachers in Nigeria, the implementation process of the 12th-grade Chemistry Curriculum is suitable for student-centered activities. This is because, according to some participants, the chemistry curriculum allows them to use different methods, such as interactive methods, group discussion methods and many more while implementing the curriculum. However, some teachers with contrary views stated that the lecture method is mostly used due to inadequate learning materials and a shortage of laboratory equipment. In Türkiye, it can be seen that most of the teachers agreed with the curriculum's implementation process. Also, an interview with some teachers in Türkiye revealed a need to improve teaching methods for an effective teaching-learning process. In this present study, it was discovered that the teaching of chemistry is didactic and teacher- centered, and the 12th-grade chemistry curriculum was designed on the guided discovery approach which required students' involvement and participation during the teaching and learning process. Most methods used by chemistry teachers who participated in this study seemed teacher-centered, with no room for students to contribute to the whole process. Teachers focused on gadgets to make students pass their exams rather than retain the knowledge and skills for solving societal needs. From this point of view, it can be said that not all teachers from both Türkiye and Nigeria have a positive perception of the implementation process of the 12th-grade chemistry curriculum. In the second sub-dimension, some participating teachers from Nigeria expressed positive opinions about the collaborative activities during chemistry class. However, some participating teachers stated that collaborating activities are essential, especially when conducting practical classes. However, a participant from Nigeria who expressed dissatisfaction with the collaborative activities stated that it is challenging to group students and allow them to perform practical alone due to the nature of chemistry.

The participant believes that chemistry is abstract, making it more difficult for students to work as a group. Other reasons include some topics that are difficult and abstract as well in nature. While in Türkiye, most teachers who participated in the questionnaire believed that the chemistry curriculum is suitable for engaging students in collaborative activities. Similarly, some teachers who participated in the semi-structured interview stated that the curriculum is unsuitable for engaging students in collaborative activities. Some of them preferred one-on- one question-and-answer methods during classroom activities. In the third sub-dimension, when asked about the implementation process of the 12th-grade chemistry curriculum, which could increase the cognitive success of the students, the majority of the participants from Nigeria expressed positive opinions. That means implementing the 12th-grade chemistry curriculum increases the cognitive success of the students in one way or another. In Türkiye, similarly, it was revealed that most teachers believed that implementing the 12th-grade chemistry curriculum increases the cognitive success of the students. From this point of view, there is no significant difference between the two countries regarding their responses. Most participants from Nigeria believe that the 12th-grade chemistry course curriculum implementation process ensures that what is learned is transferred to daily life. However, few teachers have negative opinions on this aspect. Similar responses were obtained during semi- structured interviews with some teachers from Nigeria; they believed that even though not fully what is learnt is partially transferred to students' daily lives. However, one of the participants believed that the chemistry curriculum/contents prepare students for industrial work rather than for solving societal problems. While in Türkiye, most teachers who participated in the study stated that what is learnt is transferred to daily life. However, while conducting semi-structured interviews with some teachers, it was revealed that not all learnt has been transferred but some. One of the participants stated that they mostly focused on exams rather than transferring what was learned to daily life.

In Türkiye, most of the teachers express positive opinions regarding the curriculum's implementation process, which increases the interest and success of the students in the chemistry lesson, the student-centered activities are used, and what is learned is transferred to daily life. It was stated that teacher-centered activities were partially included in the process. It can be said that there are no significant differences between Türkiye and Nigeria in terms of curriculum implementation process, teaching process and transferring what is learnt to daily life. In the sixth sub-dimension, most teachers believed that peer evaluation forms are applied, including students' performance in the process and participation in activities in the evaluation. Many teachers from Türkiye do not find the number of exams held during the year sufficient. similar findings were observed in the study conducted by Seçken & Kunduz (2013), they found that the measurement and evaluation examples in the curriculum were insufficient and that they saw that students tended to memorize when they used similar evaluation examples in measurement and evaluation activities. For this reason, teachers stated that they preferred to use questions they developed themselves and that they thought there was an incompatibility between the measurement tools used in the university entrance exam and the evaluation examples in the curriculum. Teachers partially agree with the assessment tools measuring high- level thinking skills "In the 12th-grade Chemistry Lesson. From this point of view, it can be said that most teachers

from both Türkiye and Nigeria believe that the forms are applied in evaluating the lesson. However, there is an incompatibility between the termly evaluation tools and the university entrance evaluation tools. It has been determined that there is diversity in the valuation tools recommended for evaluating students in the chemistry curriculum. According to the teachers in Türkiye and Nigeria, the evaluation tools in the chemistry curriculum were moderately valid and reliable. According to the aims of this study, it can be said that there are no significant differences between Türkiye and Nigeria in terms of this dimension.

21. Discussion on the Product Dimension

The product dimension: Within the scope of the product dimension, the levels reached by the students at the end of the curriculum were evaluated. According to the results of the evaluation, it was determined that the majority of the teachers reported positive opinions. It is considered essential to discuss the critical statements regarding the product dimension one by one as follows: The fact that a significant part of the teachers in Nigeria expressed their opinions at the level of "I partially agree" shows that there are some problems in reaching the expected success of the students at the end of the curriculum. However, most teachers who participated in the first sub-dimension questionnaire agreed that student success reached the desired level at the end of the 12th-grade Chemistry lesson. Some teachers stated that not all students can achieve the desired level of achievement.

This could be associated with the inability of the teachers to fully understand the concept of the general objectives of the curriculum and implementation process. Similarly, Anil & Oğuz Er (2014) in their study believe that the general objectives in the curriculum are not at a level that can be gained by students, and the objectives related to the psycho-motor and affective domains are also not at a sufficient level. For this reason, most students need help to perform some experiments independently at the end of the curriculum. Teachers in Türkiye agree that the students have reached the desired cognitive level at the end of the curriculum. In Türkiye, students' achievement level is measured at the end of TYT and AYT exams. However, two participants in the semi-structured interview stated that students' achievement level is sufficient. Similarly, in Nigeria, most teachers believe that the basic concepts are learned by students in the end. This reveals that most of the students learn the basic chemistry concepts at the end of the 12th-grade chemistry lesson. In the third sub- dimension, "At the end of the 12th-grade chemistry lesson, the students' attitudes toward chemistry changed positively," most of the participants are at the level of "I strongly agree, and I agree" that at the end of the chemistry lesson, the students' attitudes toward chemistry changed positively. However, in this dimension, some teachers have negative perceptions about the nature of the student's attitude at the end of the lesson. It was revealed that some students enter the class with the preconception that chemistry is complicated and that there is little effort by teachers, which affects their ability to learn chemistry. In other semi-structured interviews with some teachers, they stated that due to the motivation given to students, their attitude towards learning chemistry changes positively. Similarly, in Türkiye, most teachers have positive opinions, believing that most students' attitudes toward learning chemistry change positively at the end of the curriculum. In the fourth and fifth sub-dimension, "At the end of the 12th-grade chemistry lesson, students' problem-solving and scientific thinking skills are developed," most of the participants from Nigeria believe that students' scientific thinking and problem-solving skills are developed at the end. Similarly, in Türkiye, at the end of the curriculum, teachers believed that students' problem-solving and scientific thinking skills had improved. The sixth sub-dimension shows that most teachers have positive opinions about this sub-dimension. From this point of view, most teachers believe that the achievements of the chemistry curriculum outcomes can be measured at the end of the lesson. Similarly, according to the evaluation results obtained in Türkiye, it was determined that most teachers have positive views on this dimension. Conclusively, according to the evaluation and comparison of the findings obtained from Türkiye and Nigeria, it can be seen that there are no significant differences between the two countries in terms of chemistry curriculum implementation.

22. Conclusion

The chemistry curriculum in Türkiye and Nigeria aims to provide an integrated curriculum that encourages metacognitive skills and provides meaningful and permanent education. The curriculum in Nigeria focuses on developing students' interest in chemistry, science, technology, and mathematics (STM) knowledge and skills, aiming to create employment and wealth. Both countries have adopted various teaching methods, materials, and learning environments to facilitate the use of science concepts and techniques. The objectives of the 12th-grade chemistry curriculum in Türkiye and Nigeria are consistent, with teachers stating that the objectives are sufficient, clear, and understandable. The content, input, process, and product dimensions were evaluated using the CIPP evaluation model. The results between Türkiye and Nigeria were compared while discussing the critical findings of all dimensions and their effects on the curriculum evaluation as follows: It was concluded that most teachers in Nigeria and Türkiye agree on the clarity of objectives in their chemistry curriculum. However, some participants in Nigeria felt the goals needed more clarification. In Türkiye, most teachers believe the objectives are partially stated, but some believe they are clearly stated. In the second sub-dimension, most teachers believed that the objectives were attainable, but two participants in the qualitative part felt they were not fully achievable due to the education system's insufficient provision. In Türkiye, most participants agreed that objectives are achievable. In the fourth sub-dimension, most participants in Nigeria and Türkiye agree that the topics and time allocated are compatible. However, some participants disagreed or had very few negative opinions. Overall, the time and topics allocated in both countries are consistent, indicating that the objectives are clear and achievable. Conclusively, the participants in Nigeria and Türkiye agreed that the curriculum's outcomes were clearly stated, with no significant difference between the two countries. However, in Türkiye, 70% of participants believed the theoretical information

was sufficient, while two participants expressed insufficient opinions. This could be concluded that theoretical knowledge in the 12th-grade chemistry curriculum is considered sufficient in Nigeria while partially sufficient in Türkiye.

As a result of the findings, it was concluded that teachers in Nigeria and Türkiye have a positive perception of the quality of their chemistry textbooks. Most teachers believe that textbooks are remarkable and beneficial for students in both countries. However, teachers in Türkiye have expressed concerns about the student's prior knowledge and skill levels for implementing the 12th-grade chemistry curriculum. The structure of the textbooks is also a concern, with many teachers expressing positive opinions. The textbooks facilitate the realization of gains, but some teachers in Türkiye believe there is a shortage of information. Some teachers in Nigeria believe that the topics are consistent with the course's achievements, while in Türkiye, some teachers argue that the course load negatively affect the subject's achievements. It was concluded that Türkiye and Nigeria have different perspectives on the implementation of the 12th-grade Chemistry Course curriculum. In Türkiye, most teachers agree with the curriculum's implementation process, but some teachers in Nigeria express dissatisfaction with the lecture method due to inadequate learning materials and a shortage of laboratory equipment. In Türkiye, teachers stated that the lack of laboratories in the schools negatively affects the whole process. In terms of collaborative activities, most teachers in Türkiye believe that collaborative activities are essential. However, some teachers in Türkiye find it challenging to group students and perform practicals alone due to the abstract nature of chemistry and the lack of laboratories in the schools. In terms of cognitive success, most teachers in Türkiye believe that the curriculum increases students' cognitive success. However, some teachers in Türkiye focus on exams rather than transferring what is learned to daily life.

In the sixth sub-dimension, most teachers believe that peer evaluation forms are applied, including students' performance and participation in activities. However, many teachers in Türkiye do not find the number of exams held during the year sufficient. In conclusion, there is no significant difference between Türkiye and Nigeria in terms of curriculum implementation process, teaching process, and transferring what is learned to daily life. The evaluation tools in the chemistry curriculum are moderately valid and reliable, and the implementation process is suitable for both countries. According to this study, it was concluded that teachers in Nigeria and Türkiye have similar opinions on the success of chemistry curriculums. While in Nigeria the level of students' success is partial, in Türkiye students reach the desired cognitive level at the end of the curriculum. It was also believed that students learn basic chemistry concepts at the end of the curriculum. However, some teachers have negative perceptions about students' attitudes towards chemistry, arguing that there may be preconceptions about the complexity of the subject and lack of effort from teachers. Despite this, teachers believe that students' problem- solving and scientific thinking skills improve at the end of the curriculum. The study concludes that there are no significant differences between the two countries in terms of chemistry curriculum implementation [34-49].

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