Chemistry lecturers' knowledge and attitudes towards the implementation of the four-year Bachelor of Education (B.Ed.) chemistry curriculum in colleges of education in the Northern Zone of Ghana

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ABSTRACT

This study examined chemistry lecturers' knowledge and attitudes towards the implementation of the new four-year Bachelor of Education (B.Ed.) chemistry curriculum in Colleges of Education (CoEs) in the Northern Zone of Ghana. The study was guided by Diffusion of Innovation theory and adopted a descriptive survey design within the pragmatic paradigm, using mixed-methods approach. The study involved 14 chemistry lecturers purposively selected from five science and mathematics Colleges of Education in the Northern Zone. Quantitative data were collected using a questionnaire, while qualitative data were obtained through semi-structured interviews with five volunteer participants. The quantitative data were summarised using means and standard deviations, while thematic analysis was used to analyse the interview transcripts and triangulate the questionnaire findings. The results revealed that the lecturers had high overall knowledge of the new curriculum (M = 3.50, SD = 1.13), particularly its general provisions, aims, and instructional strategies. However, their knowledge of the prescribed assessment strategies was moderate (M = 3.39, SD = 0.71). Despite their relatively high curriculum knowledge, the lecturers demonstrated an overall negative attitude towards implementation the curriculum (M = 2.51, SD = 0.72). Interview findings attributed the lecturers' concerns to inadequate teaching and learning resources, delays in procuring materials, limited time for practical activities, and dissatisfaction with curriculum monitoring procedures. The study concludes that curriculum knowledge alone may not guarantee effective implementation without adequate institutional support and constructive stakeholder engagement. It recommends strengthening professional development, improving the availability of instructional resources, allocating sufficient time for practical activities, and adopting collaborative approaches to curriculum monitoring.

Keywords: Attitude, Bachelor of Education, Chemistry Lecturers, Chemistry Curriculum, Knowledge

1. INTRODUCTION

The outcome of students' learning of scientific knowledge, skills, critical thinking ability and interest that is required for achievement in their studies and careers in science-related discipline, especially chemistry, depends on the appropriate implementation of the curricula at the appropriate level. Typically, the chemistry curricula aim to provide students with chemical concepts, laboratory skills, and the ability to apply such knowledge to solve real-world problems (Bybee, 2010). The understanding of chemistry is very essential for student offering science discipline because chemistry is often described as the central science (Dorhout, 2018). The justification for this statement is that students from different fields require knowledge of the behaviour of matter. Chemistry plays a vital role in all aspects of human existence; hence, its study in schools must be taken seriously (Mahaffy, 2019).

In the teacher education institutions, teacher candidates need to be taught by well-informed teacher educators regarding the content and pedagogical approaches outlined in the curriculum. The teacher educators should also have a positive mindset towards the implementation the curriculum. The knowledge would direct the teacher educators to implement the curriculum in the manner that was proposed by its planners while the attitudes would moderate the implementation process. Studies have revealed that knowledge and understanding of curriculum goals and content is by teachers are vital for implementation fidelity (Addai-Mununkum & Setordzi, 2023; Okorie & Akubuilo 2013; Tanas & Tuncer, 2023). As indicated by Karakuyu (2023), teachers' understanding of the curriculum content, aims, goals, pedagogical approaches, and assessment strategies determine how well they would be able to implement it.

Whenever there is a change of curriculum, information should be sought to determine the knowledge teachers have adequate knowledge about the new curriculum to establish their readiness to implementing it as expected. Teacher

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attitude has also been established by Potera and Shallah (2019) as a key factor that should be considered in determining the extent to which the curriculum is implemented with fidelity.

In recent years, Ghana revised its teacher education programme by upgrading these institutions to award four years Bachelors of Basic Education (B. Ed.) certificates. These institutions were previously awarding Diploma in Basic Education (DBE) certificates. The reform programme introduced specialism pathways in pre-service teacher training. These specialism pathways are the different programmes which pre-service teachers may choose in order to specialise in fields such as Science and Mathematics, Languages, Social Sciences among others (Ministry of Education [MoE], 2017). The pre-service teachers who choose to specialise in Science and Mathematics study courses in physics, chemistry, biology, mathematics and agricultural science as the elective subjects. The justification for these specialist programmes was it would provide the pre-service teachers with the requisite content and pedagogical knowledge in order to enable them to teach at the basic schools in Ghana (Ministry of Education, 2017).

Pre-service teachers who opt to offer the science programme, study chemistry from the second year to the fourth year. The knowledge and skills they acquire is essential for their ability to effectively teach the chemistry aspect of the basic education syllabus. The acquisition of the required knowledge and skills depends on how they are taught by their college chemistry lecturers. The ability of the college chemistry lecturers to guide the teacher candidates to acquire the desired knowledge and skills also depends on the lecturers' knowledge and understanding of the curriculum demands as well as their attitudes towards the new curriculum. According to Addai-Mununkum and Setordzi (2023), teachers are more willing to critically evaluate the applicability of a new curriculum and concentrate on its implementation once they understand the aims and the reasons for the change. On the part of attitude, Ofem et al. (2025) indicated that teachers' positive attitude and their eagerness to adopt new pedagogies were significantly associated with their knowledge of the curriculum structure and assessment methods. This current study seeks to establish the knowledge that the chemistry educators have about the new four-year B.Ed curriculum in terms of its aims, instructional strategies, and assessment methods. Furthermore, the study seeks to find out the attitudes of the lecturers towards the new chemistry curriculum.

1.1 Statement of the Problem

Since the new chemistry curriculum was introduced in the colleges of education in 2018, there is no evidence of studies to check the level of knowledge of chemistry lecturers about the new curriculum and their attitudes towards its implementation. This situation represents a risk to the programme's success as lecturers' knowledge of the programme would influence their practice in the classroom (Annan et al., 2021). Another factor that is necessary to supplement the curriculum knowledge for the successful implementation of curriculum is the lecturers' attitude (Julius et al., 2025).

Boachie et al. (2026) studied the perspective of the stakeholders, namely, the chemistry lecturers, pre-service teachers, the head of science department, and quality assurance officers on how the curriculum has been implemented since its introduction in 2018. Another study that is related to chemistry curriculum was done by Naah and Osei-Himah (2026) in the College of Education in Ghanta, which involved pre-service teachers' planning skill in the chemistry curriculum. Moreover, Ansah et al. (2020) evaluated the physical infrastructure in the chemistry laboratories of Colleges of Education. All these studies did not touch on the knowledge and attitudes of chemistry lecturers regarding the implementation of the new chemistry curriculum.

The absence of information whether the lecturers know and understand the core demands of the new curriculum, and their attitudes towards its implementation has the potential to prevent policymakers from knowing whether the curriculum is being implemented as envisaged by the planners. This study aims to fill the existing gap by focusing on the colleges in the Northern Zone of Ghana. If this study finds out that lecturers did not have the desired knowledge and attitudes that could result in successful implementation of the curriculum, targeted professional development programmes could be introduced to enhance the understanding of the curriculum as part of remedial measures. Previous studies have shown that teachers cannot implement a curriculum successfully if they lack knowledge of its contents (Nnachi, 2011; Okorie & Akubuilo, 2013).

1.2 Research Objectives

i. Ascertain the knowledge level of chemistry lecturers at the CoEs in the Northern Zone of Ghana regarding the new four-year B.Ed chemistry curriculum.
ii. Find out the attitudes of chemistry lecturers at the CoEs in the Northern Zone towards the new four-year B.Ed chemistry curriculum.

II. LITERATURE REVIEW

2.1 Theoretical Review

The theory that is the basis of this study is Diffusion of Innovation (DOI) by Rogers (2003). Rogers (2003, p. 5) defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system. Innovation is the new way in which things are being done that is different from what

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the actors know or what they are used to. In this current study, innovation is the learner-centred pedagogical approaches and assessment strategies that the new curriculum contains. These new approaches are different from the old ones that were in the previous three-year Diploma in Basic Education (DBE) curriculum. Rogers (2003) explained diffusion as the specialisation of communication through which the innovation is received. To apply it in the context of this current study, diffusion is how chemistry lecturers read and access information about the four-year B.Ed curriculum to gain a deeper understanding and insight into what they need to do in order to effectively implement it. It also includes organisation of workshops and seminars for the lecturers to update their knowledge and understanding of the approaches they are expected to adopt in their classroom practices.

Bearing in mind that acceptance of a new procedure is not a one-off event; Rogers (2003) proposed a model which is mostly knowledge seeking and carrying out activities that would minimise opposition to innovation. In the change process, the individual or decision-making unit learns about the innovation to form an attitude toward it. This attitude now determines whether the new order is either accepted or rejected. This theory therefore suits this current study in the sense that the lecturers need to get enough information about the new curriculum. This knowledge obtained through several activities forms the basis of their attitudes towards it. If they are perceived advantages in the new curriculum over the old one, then they would develop a positive feeling towards it or vice versa. It is such feeling in them that would influence how the curriculum is being implemented.

2.2 Empirical Review

2.2.1 Chemistry Curriculum Knowledge

Besides the content and pedagogical knowledge chemistry lecturers may have, effective teaching and learning depend on their knowledge and understanding of the curriculum objectives, contents, instructional strategies as well as assessment required in the curriculum. In this regard, the lecturers' knowledge of the chemistry curriculum is prerequisite for its successful implementation. Adams and Krockover (1997) opined that, pedagogical skills of the teacher are first and foremost, a requirement for effective implementation of curriculum. However, it could be argued that prior to the application of pedagogical strategies; teachers must first be familiar with the pedagogical requirements suggested in the curriculum document. This familiarity or awareness process usually takes the form of continuous professional development sessions. Supporting this proposition, Carpendale et al. (2021) suggested that, to successfully implement a curriculum, teachers should be led through various in-service training activities.

Curricula knowledge constitutes one important component of teachers' repertoire of knowledge (Christie, 2012; Schleppegrell & Christie, 2018), which according to Shulman, 1986, p.10), includes "knowledge of the materials that are available to teach a given subject or topic," and "the set of characteristics that serve as both the indications and contra-indications for the use of a particular curriculum or programme materials in particular circumstances". This knowledge may also include more general knowledge of how the curriculum works, such as having an understanding of how students generally move between topics through the school grades (Ball et al., 2008; Hill et al., 2008). Several researchers (e.g., Davis & Krajcik, 2005; Drake &Sherin, 2008; Jurow & Creighton, 2005; Remillard, 2005) have found that teachers who have knowledge about intentions of curriculum developers are able to implement it with fidelity. Musset (2010) notes that, teaching "is a complex and demanding intellectual work, one that cannot be accomplished without adequate preparation" (p. 3). This aspect of the current chemistry curriculum in the Colleges of Education in Ghana is yet to be explored, especially, in the Northern Zone, since its inception in 2018.

2.2.2 Teachers' Attitudes Towards Curriculum Change

Igbokwe et al. (2014) defined attitude as a psychological construct which is a persons' favourable or unfavourable evaluation of an object, idea or concept that influence his perception, feelings and behaviour. Researchers have established a relationship between teachers' attitudes and their classroom practices. Julius et al. (2025) conducted research in Mbarara City South; Uganda on teachers' attitude towards the implementation of competency-based curriculum. They found that attitude had a direct relationship with the implementation of curriculum. Their study concludes that attitudes of teachers significantly contribute to the success or failure of curriculum implementation. Anthony et al. (2023) also confirmed that attitude was among the most important factors limiting the implementation of curriculum change. For Suzan and Kazaara (2023), the attitudes, perceptions and beliefs of teachers towards a curriculum implementation are the primary contributors to its implementation success.

If chemistry lecturers at the CoEs harbour any negative attitudes towards the new learner-centred B.Ed chemistry curriculum, the implemented may not be as envisaged by the designers. In such case, the preservice science teachers at the CoEs would be denied the chance to benefit from innovative pedagogical strategies outlined in the curriculum. The reason is that negative attitudes can be easily metamorphosed to resistance, which is one of the biggest threats to curriculum reforms (Snyder, 2017). To forestall any form of resistance to curriculum reforms, Al-Shabatat (2014) and Rakes and Dunn (2015), contend that it is strategic for educational authorities to know teachers' fears and perceptions on a new curriculum in advance, so that proper measures should be taken to reduce their impact during the

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implementation process. Until a study like this nature is carried out, the fears, anxiety and attitudes of the implementors, in the case of the chemistry curriculum at the CoEs cannot be established. This study is the first to provide such evidence.

III. METHODOLOGY

3.1 Research Design

This research employed a descriptive survey design. Descriptive surveys help to establish people's knowledge, attitudes, values, opinions among others (Creswell, 2002). This design was deemed appropriate for the study because it enabled the researchers to get information that answered questions about the knowledge of chemistry lecturers as well as their attitudes towards the new B.Ed chemistry curriculum (Olanrewaju et al., 2021). The study aimed to explore the experiences of chemistry lecturers at the CoEs regarding the implementation of the new curriculum. To achieve this, the study was situated within the pragmatic paradigm (Liu, 2022), which offers the flexibility needed for a practical investigation of a research problem (Elgeddawy & Abouraia, 2024). The rationale for choosing this paradigm was to enable the researchers to put the research into its rightful context (Foster, 2024). Therefore, mixed methods approach was applied whereby quantitative and qualitative data were collected to facilitate the exploration of the phenomena under investigation.

3.2 Study Area

The Colleges of Education in Ghana are clustered into five Zones. This study was conducted in the Northern Zone, which comprises five administrative regions including the Northern, Savanna, North East, Upper East, and the Upper West Regions. In this zone, five colleges are designated as Science Mathematics colleges. Their mission is to train pre-service science and mathematics teachers to teach at the basic schools.

3.3 Target population

The target population of this study consisted of the chemistry lecturers in all the 18 sciences and mathematics Colleges of Education in Ghana. The number of chemistry lecturers in these colleges was 39 at the time of data collection. These colleges are widely dispersed among the 16 regions in the Ghana.

3.4 Sampling and sample size

The study used convenient sampling to select the Northern Zone. This zone was convenient due to its proximity to the researchers. The five colleges were purposively selected because they were specialist science and mathematics colleges. The study was interested in the chemistry curriculum; hence, the chemistry lecturers were also purposively selected. The number of chemistry lecturers in the selected colleges was only 14. This comprised 13 males and 1 female. Because the number was small, all the lecturers were involved in the because they were those implementing the curriculum at the time (Tajik et al., 2024).

3.5 Data Collection Instruments and Procedures

The instruments used for data collection were Chemistry Lecturers' Knowledge and Attitude Questionnaire (CLKAQ), and an interview guide. The questionnaire was used to collect quantitative data, while the interview guide was the means to collect the qualitative data. All the respondents responded to the survey questionnaire while five of them (one from each college) volunteered to participate in the interview.

The questionnaire was made of two sections. Section A, which contained 20 items, was adapted from the work of Okorie and Akabuilo (2013). Section B on the other hand was a modified version of a tool called Attitude towards Change Instrument (ATCI) designed by Dunham et al. (1989). It measured the attitude of the lecturers towards the implementation of new chemistry curriculum. The questionnaire, which was a 5-point Likert agreement scale, was rated as follows: Strongly disagree (=1), Disagree (=2), Undecided (=3), Agree (=4), and strongly agree (=5). The Neutral or Undecided category was included so that respondents would not be compelled to either agree or disagree to a statement.

The instruments were face-validated by language experts to ensure that there were no ambiguities in the items (Oluwatayo, 2012). The content validity of the instruments was undertaken by science education and curriculum experts to ensure that the items actually covered the contents of the chemistry curriculum (Ikart, 2019; Lambie et al., 2017). These processes ensured that the items were fit for purpose (DeVellis, 2016).

The reliability of the instruments was determined on a pilot tested sample of 6 chemistry lecturers from two Colleges of Education outside the study area (Fraenkel & Wallen, 2006). The Cronbach alpha coefficient for the knowledge scale was 0.84. This was considered to be good internal consistency of the instrument (Field, 2009). This value was comparable to the original instrument from which the present one was adapted, which had a Cronbach alpha coefficient of 0.87. The reliability coefficient for the attitude sub-scale was 0.88, and this was considered high. The original instrument developed by Dunham, et al. (1989) had a reliability coefficient of 0.90. The questionnaire was self-

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administered by the researchers. After the questionnaire administration, one participant in each college volunteered to participate in the interview process.

3.6 Data Analysis

Descriptive statistics, using the statistical package for the social sciences (SPSS) version 20, were utilised to describe and summarise the quantitative data into mean scores and standard deviations. SPSS scored the negatively worded items in reverse with strongly disagree (=5), disagree (=4), uncertain (=3), agree (=2) and strongly agree (=1). This was performed to provide a consistency of values between the positively and negatively worded items. Furthermore, a criterion was established to facilitate the interpretation of the mean scores. The criterion used by (Kasapolu, 2010) was adopted to give levels to the mean scores. Very low: 1.0-1.80, low: 1.81-2.60, moderate: 2.61-3.40, high: 3.41-4.20 and very high: 4.21-5.0. For the attitude sub-scale, the criterion used by Fadhilah et al. (2018) was adopted for attitude level interpretation. Mean attitude scores were interpreted as follows: Negative attitude = 1.00-2.60; neutral attitude: 2.61-3.40; and positive attitude: 3.41- 5.00.

Regarding the qualitative data, thematic analysis was used to group the responses into themes. The voice recordings were transcribed and the transcripts analysed and coded using a qualitative data analysis package, Nvivo. In order to ensure anonymity of institutions, the colleges were coded from college A to college E. The five volunteers were then given code names such as College lecturer A (CLA), College lecturer B (CLB) through to college lecturer E (CLE). These pseudonyms were used when referencing to the individual respondents in describing their responses.

3.7 Ethical considerations

Written permission was received from the colleges' administration before data collection. In addition, the participants signed a consent form before data collection. To assure the participants that their identity was kept anonymous, they were identified by pseudonyms (Saunders et al., 2015). Rapport was established between the researchers and participants before data collection so that they could freely expressed their views, especially, during the interviews. The transcribed interview data were sent to the participants to read and to crosscheck if there was semblance between their views and the transcribed data so as to avoid misinterpretation of their views.

IV. FINDINGS & DISCUSSION

4.1 Findings

4.1.1 Chemistry Lecturers' Knowledge of the New B.Ed Chemistry Curriculum

The knowledge scale was categorised into four sub-scales. Each of the sub-scales was presented in a separate table for ease of analysis. The mean score per item was categorised as: Very low (1-1.80), low (1.81-2.60), moderate (2.61-3.40), high (3.41- 4.20), and very high (4.21-5).

Chemistry lecturers' general knowledge of the B.Ed curriculum

Table 1 presents the mean scores, standard deviations as well as the interpretation made with respect to each item. Generally, the sub-scale mean score was determined to be 3.50 (SD = 1.13), indicating high knowledge. That is to say, the lecturers' general knowledge about the new curriculum was high.

Table 1

Mean Scores and Standard Deviations of Chemistry Lecturers' General Knowledge of the New Curriculum

Item number	Item statement	Mean	SD	Interpretation
1	I am familiar with the new 4-year chemistry curriculum introduced at the CoEs.	5.00	0.00	Very high
2	The curriculum for the 4-year B.Ed programme is based on the provisions of the NTECF.	4.29	0.47	Very high
3	The Chemistry curriculum for the 4-year B.Ed programme is based on the provisions of the National Teachers' Standards (NTS).	4.43	0.94	Very high
*4	T-TEL is a non-governmental organisation (NGO) working with the CoEs to implement the new reform programme.	2.21	0.82	Low
*5	The curriculum reforms at the CoEs were the initiative of T-TEL.	2.07	0.99	Low
*6	In the structure of the 4-year B.Ed programme, science students offer chemistry every semester.	3.00	1.36	Moderate
	Average	3.50	1.13	High

*Scoring reversed for negatively worded items; SD = standard deviation.

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The mean scores of the individual items ranged between 2.07 (SD = 0.99) and 5.00 (SD = 0.00). The results in Table 1 showed that the respondents recorded very high knowledge in three items. Thus, they indicated very high knowledge regarding their familiarity with the new curriculum (M =5.00, SD =0.00), the linkage between the new curriculum and national teacher education curriculum framework (NTECF) document (M= 4.29, SD = 0.47) as well as the national teaching standards (NTS) (M = 4.43, SD =0.94). Respondents however, had low knowledge about the nature of the organisation known as Transforming Teacher Education and Learning (T-TEL) (M=2.21, SD =0.82), and also, the initiators of the curriculum reforms at the CoEs (M=2.07, SD = 0.99). Their knowledge of whether students study chemistry every semester was moderate. This meant that the respondents were not very sure about the frequency of chemistry courses per semester in the context of the new B.Ed curriculum. There was some level of convergence between the interview data and the responses in the questionnaire. During the interview, College lecturer A (CLA) explained that the colleges had been transformed from diploma to degree awarding institutions, and that necessitated the changes in the curricula. He added that there was an organisation called T-TEL that was collaborating with the government to implement the change. The following excerpts demonstrate that the lecturers were knowledgeable about the new curriculum.

> *"The little I know is that the colleges have been transformed to degree awarding institutions. Because of these changes, the various curricula for the individual courses including chemistry, have changed in structure and content. I am again aware that there is an organisation called T-TEL that is spearheading the reforms. I think they work hand in hand with the Ministry of Education",* CLA.

Another respondent also shared almost the same perception about the reforms. However, his assertion was that the reforms were at the instance of a non-governmental organisation (NGO).

> *These reforms emanated from these foreign NGOs. I am talking about T-TEL. They are responsible for the changes at the colleges. The students are now doing 4-years for a degree, as against the 3-years for the diploma. There are also changes as to how we are supposed to teach and assess the student*, CLC.

Lecturer B (CLB) seemed to have a negative perception about the reform. He was emphatic in his non-factual statements:

> *"It is an NGO which is partnering the government to introduce the curriculum changes at the colleges. They have highjacked the whole reform process and the ministry has to follow their dictates",* CLB alleged.

This opinion suggested that some of the respondents had wrong perception about certain aspects of the new B.Ed curriculum.

Chemistry Lecturers' knowledge of the new curriculum in terms of its aims

Table 2 shows the mean scores, and standard deviations of respondents in relation to the items.

Table2

Mean Scores and Standard Deviation of Lecturers' Knowledge of the New Curriculum in Terms of its Aims

Item number	Item Description	Mean	SD	Knowledge level
7	The new curriculum does not require continuous professional development (CPD) for the lecturers.	4.50	1.09	Very high
8	The curriculum aims to enable student teachers learn how to cater for grade level specialisms.	4.43	0.85	Very high
9	The curriculum intends to promote equity and inclusivity in the classroom.	4.29	0.83	Very high
*10	The curriculum provides separate courses for chemistry practical work and theory.	2.79	1.53	Moderate
*11	The curriculum intends to develop in the student teachers the pleasure in learning about Chemistry in their environment.	3.71	0.61	High
	Average	3.94	1.43	High

*Scoring reversed for negatively worded items; SD = standard deviation.

The average mean score for participants' knowledge regarding the aims of the curriculum revealed that the chemistry lecturers had high knowledge (M =3.94, SD = 1.43). The least knowledge of participants with respect to the individual items was moderate (M=2.79, SD=1.53) (Item 10). The rest were either high or very high. That suggested that respondents were knowledgeable regarding the items under the aims of the curriculum.

Chemistry Lecturers' knowledge of the new curriculum in terms of the instructional strategies

Table 3 displays the mean scores and standard deviation of lecturers' knowledge of the B.Ed curriculum in terms of its required instructional strategies.

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Table 3

Mean Scores and standard deviations of Lecturers' Knowledge of the Instructional Strategies in the New Chemistry Curriculum

Item number	Item Description	Mean	SD	Interpretation
12	Songs, role-play and modeling are teaching strategies recommended in the new curriculum.	4.79	0.80	Very high
*13	Student teachers are not expected to talk in the classroom in accordance with the new curriculum.	4.57	0.85	Very high
14	Concept mapping is a strategy required by the curriculum.	3.71	1.20	High
*15	Multimedia presentation is one strategy by the new curriculum	3.79	0.80	High
*16	The new chemistry curriculum does not recommend discovery learning by students.	4.00	1.36	High
	Average	4.17	0.96	High

*Scoring reversed for negatively worded items, SD = standard deviation

With respect to the specific items, the knowledge scores ranged between high and very high, indicate that the lecturers were very knowledgeable about the items under the instructional strategies sub-scale. During the interview sessions, the responses from participants confirmed their high knowledge about the strategies required of them. They mentioned that knowledge acquisition by the teacher candidates has shifted from lecturer-centredness to that of learner-centredness. Their responses are summarised in the statements of two participants: *"The new curriculum has shifted the focus of knowledge acquisition from the lecturers, as the centre of learning to the students. The learners are expected to do the learning, with us (lecturers) serving as just a facilitator"*, CLA. Another lecturer also expressed similar sentiments: *"The new curriculum is good. It is learner-centred, and would remove the fear our students always have in chemistry. I believe it would produce the calibre of science teachers the country is envisaging,"* CTB.

Chemistry Lecturers' Knowledge of the Curriculum in Terms of Assessment Strategies

Table 4 presents the mean scores, standard deviations of lecturers' knowledge regarding the assessment strategies expected of them in the implementation of the new B.Ed chemistry curriculum.

Table 4

Mean Scores of Lecturers Knowledge of the Assessment Strategies in the New Chemistry Curriculum

Item number	Item Description	Mean	SD	Knowledge level
17	Professional portfolios are recommended as assessment techniques.	3.07	1.54	Moderate
18	Projects works are recommended for use assessing students' learning.	3.50	1.65	High
19	Quizzes are not recommended for assessment in the new curriculum.	4.00	1.66	High
*20	The new curriculum recommends report writing as a means of evaluating students.	3.00	1.75	Moderate
	Average	3.39	0.71	Moderate

*Scoring reversed for negatively worded items, SD = standard deviation

This sub-scale had average mean score of 3.39 (SD = 0.71), which indicated that participants' overall knowledge level regarding the assessment strategies was moderate. The mean scores of the individual items in the sub-scale ranged between 3.00 (low) and 4.00 (high). The standard deviations also ranged between 1.54 and 1.75. The standard deviation values indicated that the responses were widely spread. The lecturers had moderate knowledge regarding whether professional portfolio (M=3.07, SD=1.54), and report writing (M=3.00, SD =1.75) were included in the assessment strategies (Items 17 and 20). They, however, had high knowledge regarding the use of project work (3.50, SD = 1.65) and quizzes (M = 4.00, SD = 1.66).

4.1.2 Chemistry Lecturers' Attitudes Towards the New Four-year B.Ed Curriculum

As stated earlier, a criterion was developed for easy interpretation of the results. The mean scores were categorised into three levels: Negative, neutral, and positive attitudes. The range of values for each category was as follows: 1.00–2.60 = Negative attitude, 2.61–3.40 = neutral attitude, and 3.41- 5.00 = positive attitude. The mean scores and standard deviations of each item in the attitude scale are presented in Table 5.

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Table 5

Chemistry Lecturers' Attitude Towards the new four-year B.Ed Chemistry Curriculum

Item number	Item description	Mean(M)	SD	Attitude
1	The four-year B.Ed curriculum change excites me.	2.14	0.66	Negative
2	Learners get bored during chemistry lessons.	3.36	1.01	Neutral
3	I like the changes in the new chemistry curriculum.	2.57	1.02	Negative
4	I enjoy teaching chemistry with the new Curriculum.	2.07	0.99	Negative
*5	I find it more demanding teaching chemistry based on the new curriculum compared to the previous one.	2.93	1.14	Neutral
6	The new curriculum's approaches to teaching are very interesting to me.	2.43	1.09	Negative
*7	I found it difficult to get the needed resources to teach the new curriculum.	1.14	1.21	Negative
8	The procedures outlined in the new curriculum makes it easier for students to understand chemistry concepts.	2.29	0.73	Negative
9	The strategies in the new curriculum enable me to perform better.	3.00	1.24	Neutral
*10	Teaching with the new curriculum is more tiring than the old one.	2.07	1.21	Negative
*11	The new curriculum does not offer room for creativity.	2.07	1.32	Negative
12	I intend to do everything possible to support the new curriculum change.	4.21	1.32	Positive
13	The activities of T-TEL irritate me.	2.29	1.38	Negative
	Average	2.51	0.72	Negative

*Scoring reversed for negatively worded items

The mean scores for the individual items ranged between 1.14 (negative attitude) and 4.21(positive attitude) while the standard deviations also ranged between 0.66 and 1.38. The mean score for the scale was 2.51 (SD = 0.72), indicating negative attitude. Item -by-item analysis of the results showed that chemistry lecturers were positive about their willingness to put up their best to support the new curriculum (M=4.21, SD =1.32). They also had neutral attitude towards the fact that chemistry lessons were boring for their learners (M=3.36, SD=1.01). They were also not bothered about the heavy demands of the new curriculum (M=2.93, SD=1.14). Moreover, the lecturers were uncertain whether the strategies in the new curriculum enhanced their instructional activities (M=3.00, SD= 1.24). All other items recorded negative attitude, as indicated in Table 5.

The attitudes recorded were re-echoed by participants' comments during the interview sessions. The lecturers expressed their frustrations in getting the required materials to carry out some practical activities as required by the curriculum. Almost all respondents had the same experiences regarding lack of materials and delays in acquisitions.

> *Sometimes you may want to carry out an experiment but the required chemicals and materials may not be available. What can you do then? Also, when you make request for materials to be purchased for teaching and learning, it can take a whole semester before the materials are provided. This among others is one of the challenges I faced in my college*, participant CLD.

Respondents also expressed their dislike for the supervisory activities of T-TEL officials. Their sentiments are summarised in the words of two of them.

> *"Sometimes you are in the class teaching, and someone walks in, that they are from T-TEL office. They would demand for proforma, student exercises, and eventually sit in the class to monitor teaching. I always feel bad about it",* CLC.

Another respondent narrated how he was virtually compelled to teach a lesson even though he was not scheduled at the time. According to him, this was done in the name of monitoring by some T-TEL officials.

> *One day, they (*T-TEL officials*) came to my college to inspect how I teach. I told them I did not have a lesson on that day but they insisted that I teach. I obliged, only for them to comment that I thought without proforma, and also that my lesson was not in conformity with the curriculum. I was not happy about it,* CLE expressed his frustration.

Lecturers had concerns about the different conditions in each college and how they might affect the smooth implementation of the new curriculum. They mentioned human and material resources as factors that could militate against the implementation process. The words of lecturer D echo their sentiments:

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"The modes of assessing the students do not encourage us to engage them in activities to promote creativity and innovation. We are not given enough time to do some of the creative pedagogies as expected".

He concluded that the laudable aims of the curriculum would not be achieved if the situation continues.

"I don't have hope that the aims and objectives of chemistry education will be achieved. We teachers will do our best but I don't see anything good coming out from it", CLD.

4.2 Discussion

This study examined the knowledge and attitudes of chemistry lecturers at the Colleges of Education (CoEs) in the Northern Zone of Ghana regarding implementation of the new four-year Bachelor of Education (B.Ed) curriculum. The study found that the lecturers had high knowledge but held a negative attitude towards the curriculum. The sub-sections below discuss these findings in relation to previous studies.

4.2.1 Teachers' Knowledge of a Curriculum Change

Teachers must necessarily have a certain level of knowledge in order to be efficient in their profession (Hill et al., 2008; Rowland et al., 2009). According to McNeill et al. (2016), teachers' preparedness for the implementation of a new curriculum is hinged on their knowledge of the various elements of the curriculum. Howard (2024) opined that when teachers' level of awareness of curriculum is high, it helps them plan better and implement the curriculum to meet the expectations of stakeholders.

The finding of this current study regarding the lecturers' knowledge of the new curriculum agreed with previous studies. A study by Aytaç et al. (2025) on teachers' curriculum awareness and their self-efficacy perceptions towards the teaching of thinking skills found that the teachers had high awareness about the various elements of the curriculum. The finding of the current study suggests that the chemistry lecturers at the CoEs in the Northern Zone of Ghana are knowledgeable about the aims, instructional approaches, and the assessment strategies of the new four-year B.Ed curriculum. It further suggested that the lecturers can apply the strategies effectively in the classrooms. Similar results were obtained by the study of Pektaş and Pesen's (2021). However, the finding of this current study was at variance with that of Annan et al. (2021). Their study, which investigated the curriculum content knowledge of science teachers at the basic school level in Ghana, found that the teachers had low knowledge of the science curriculum. The high knowledge exhibited by the lecturers was heartwarming, because knowledge of curriculum content is essential for its effective implementation (Tetteh &Kumi-Agbasa, 2019). This knowledge is prerequisite for achieving the desired learning outcomes regarding science teacher education at the CoEs (Okorie &Akabuilo, 2013).

4.2.2 Teachers' Attitudes Towards Curriculum Change

The second objective of this study was to find out the kind of attitudes the chemistry lecturers had towards the new chemistry they were implementing. In the context of this study, chemistry lecturers' concerns and perceptions on the implementation of the new B.Ed curriculum constitute their attitudes towards it (Mpuangnan & Adusei, 2021). The results from the attitude scale indicated that the chemistry lecturers had an overall negative attitude. This finding is concerning because teachers with a positive attitude towards a curriculum reform would be committed to its implementation strategies. On the other hand, if the attitude is negative, the lecturers are likely not to adhere to the strategies required of them in the implementing the curriculum (Santiago, 2019). This finding corroborated previous research by Janíka et al. (2018). It however, contradicted the findings of Potera and Shala (2019), and Thura and Khaing (2020). This finding of negative attitude underscores the resentment chemistry lecturers had regarding how the implementation of the reform was being handled. They demonstrated sustained revulsion against the handling of the supervisory aspect of the curriculum implementation, especially, T-TEL officials.

The lecturers had high awareness of the new curriculum, but had negative attitude towards it. Other researchers have had complete contrary findings. Melese (2019) found that college of education tutors in Ethiopia were not knowledgeable about a newly introduced curriculum, yet they had positive attitudes towards it. The findings of this current study highlight the need for pre-implementation engagement with the lecturers in the colleges regarding what is expected of them. This may reduce the revulsion shown by lecturers during the implementation monitoring and supervisor activities by state authorities. This revulsion could lead to resistance to the recommended implementation strategies.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

The study aimed to determine the knowledge and attitudes of chemistry lecturers at the CoEs in Ghana about the new four-year Bachelor of Education (B.Ed) curriculum. The study established that the lecturers were knowledgeable of the new curriculum, but their overall attitude was negative. From the findings, it is concluded that the new four-year Bachelor of Education (B.Ed) chemistry curriculum would not be implemented at the CoEs in the Northern Zone of

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Ghana in the manner envisaged by its developers. The implementation has faced resistance from the lecturers. Lecturers openly complained about the actions of certain institutions and personnel regarding the implementation processes.

5.2 Recommendations

Based on the findings, it was recommended that professional development activities be intensified in the colleges to sensitise the lecturers regarding the responsibilities of outside agencies concerning the curriculum implementation processes. In this case, the lecturers would not consider the monitoring activities as interferences in their work. Moreover, teaching and learning resources should be provided to ensure that instructional activities proceed seamlessly. Adequate time should also be provided to engage the students in practical activities. Future researchers should investigate the linear relationship between lecturers' curriculum knowledge and their attitudes towards implementation of the new chemistry curriculum. This study should be expanded to include as many CoEs as possible to get an insight into the curriculum implementation bottlenecks nationwide.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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REFERENCES

Adams, P. E., & Krockover, G. H. (1997). Concerns and perceptions of beginning secondary science and mathematics teachers. *Science Education, 81*(1), 29–50. https://doi.org/10.1002/(SICI)1098-237X(199701)81:1<29::AID-SCE2>3.0.CO;2-3

Addai-Mununkum, R., & Setordzi, S. (2023). Implementing curriculum change in Ghana: Exploring teachers' experiences with enacting 21st-century pedagogies. *American Journal of Qualitative Research, 7*(4), 119–139. https://doi.org/10.29333/ajqr/13660

Al-Shabatat, A. (2014). Gifted teachers' stages of concern for integrating e-learning in the gifted schools in Jordan. *Turkish Online Journal of Technology, 13*(2), 79–87.

Annan, S. T., Owusu-Fordjour, C., Koomson, C. K., Agyemang, C., Addae, R., & Anim, D. O. (2021). Curriculum knowledge of science teachers and its effects on academic performance of pupils. *International Journal of Academic Research and Reflection, 9*(3), 64–77.

Ansah, F. O., Asem, H. D., Osei-Anto, T. A., Owusu, M., & Acheampong, A. (2020). Assessing safety status of physical infrastructure in chemistry laboratories: A study of public colleges of education in Ghana. *Creative Education, 15*(12), 2455–2477.

Anthony, D., Kazaara, A. G., Kazaara, A. I., Ismail, L., & Prudence, K. (2023). The impact of teachers' teaching methods on students' performance in English subject in secondary schools in Uganda: A case study of selected secondary schools in Kampala and Wakiso. *International Journal of Academic Pedagogical Research, 7*(3), 290–297.

Aytaç, A., Kaya, R., & Demir, A. Y. (2025). A study on teachers' curriculum awareness and their perceptions of self-efficacy towards teaching thinking skills. *Academic Social Resources Journal, 10*(6), 471–483.

Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*(5), 389–407.

Boachie, S., Quansah, F., Oppong, E. K., Sam, A., & Adjei, Y. (2026). Exploring stakeholders' views on chemistry curriculum implementation in teacher education. *Teacher Education and Curriculum Studies, 11*(1), 22–30. https://doi.org/10.11648/j.tecs.20261101.13

Bybee, R. W. (2010). Advancing STEM education: A 2020 vision. *Technology and Engineering Teacher, 70*, 30–35.

Carpendale, J., Berry, A., Cooper, R., & Mitchell, I. (2021). Balancing fidelity with agency: Understanding the professional development of highly accomplished teachers. *Professional Development in Education, 50*(5), 909–927. https://doi.org/10.1080/19415257.2021.1972436

Christie, F. (2012). *Language education throughout the school years: A functional perspective*. Wiley-Blackwell.

Creswell, J. W. (2002). *Research design: Qualitative, quantitative, and mixed method approaches* (2nd ed.). Sage.

Davis, E. A., & Krajcik, J. S. (2005). Designing educative curriculum materials to promote teacher learning. *Educational Researcher, 34*(3), 3–14. https://doi.org/10.3102/0013189X034003003

DeVellis, R. F. (2016). *Scale development* (4th ed.). Sage.

Dorhout, P. (2018). Honing the central science. *Chemical Engineering News, 96*(1), 29–31.

Licensed Under Creative Commons Attribution (CC BY-NC)

Drake, C., & Sherin, M. G. (2008). Developing curriculum vision and trust: Changes in teachers' curriculum strategies. In A. R. McDuffie & M. Mather (Eds.), *Mathematics teachers at work: Connecting curriculum materials and classroom instruction* (pp. 321–337). Routledge.

Dunham, R. B., Grube, J. A., Gardner, D. G., Cummings, L. L., & Pierce, L. (1989). The development of an attitude toward change instrument. *Annual Academy of Management Conference, Madison*, 1–22.

Elgeddawy, M., & Abouraia, M. (2024, July). Pragmatism as a research paradigm. In *Proceedings of the European Conference on Research Methodology for Business and Management Studies* (pp. 71–74). Academic Conferences International Limited.

Fadhilah, T. F., Rozimela, Y., & Wahyuni, D. (2018). Writing attitude of the second-grade students at SMA Adabiah Padang. *Journal of English Language Teaching, 7*(4), 790–796.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Sage Publications.

Foster, C. (2024). Methodological pragmatism in educational research: From qualitative-quantitative to exploratory-confirmatory distinctions. *International Journal of Research and Method in Education, 47*(1), 4–19.

Fraenkel, J. R., & Wallen, N. E. (2006). *How to design and evaluate research in education* (6th ed.). McGraw-Hill.

Hill, H., Ball, D. L., & Schilling, S. G. (2008). Unpacking pedagogical content knowledge: Conceptualizing and measuring teachers' topic-specific knowledge of students. *Journal for Research in Mathematics Education, 39*(4), 372–400.

Howard, K. (2024, April 24). *Subject knowledge, pedagogy and curriculum*. https://saysmiss.wordpress.com/2025/04/24/subject-knowledge-pedagogy-and-curriculum/

Igbokwe, U. L., Mezieobi, D. I., & Eke, C. (2014). Teachers' attitude to curriculum change: Implications for inclusive education in Nigeria. *Research on Humanities and Social Sciences, 4*(11), 92–99.

Ikart, E. (2019). *Survey questionnaire survey pretesting method: An evaluation of survey questionnaire via expert* [Incomplete reference].

Janíka, T., Jankoa, T., Peškováa, K., Knechta, P., & Spurná, M. (2018). Czech teachers' attitudes towards curriculum reform implementation. *Human Affairs, 28*, 54–70. https://doi.org/10.1515/humaff-2018-0006

Julius, A., Desire, N., & Hadiijah, N. (2025). Teachers' attitude and implementation of competence-based curriculum in Nyakayojo Secondary School, Nyakayojo Division, Mbarara City South. *Metropolitan Journal of Academic Multidisciplinary Research, 4*(10), 162–174.

Jurow, A. S., & Creighton, L. (2005). Improvisational science discourse: Teaching science in two K-1 classrooms. *Linguistics and Education, 16*(3), 275–297. https://doi.org/10.1016/j.linged.2006.02.002

Karakuyu, A. (2023). The contribution of teachers' curriculum literacy on their curriculum fidelity: Curriculum literacy-curriculum fidelity. *International Journal of Curriculum and Instruction, 15*(3), 1785–1800.

Lambie, G., Blount, A., & Mullen, P. (2017). Establishing content-oriented evidence for psychological assessments. *Measurement and Evaluation in Counseling and Development, 50*(4), 210–216. https://doi.org/10.1080/07481756.2017.1336930

Liu, Y. (2022). Paradigmatic compatibility matters: A critical review of qualitative-quantitative debate in mixed methods research. *SAGE Open, 12*(1), 1–14. https://doi.org/10.1177/21582440221079922

Mahaffy, P. G., Ho, F. M., Haack, J. A., & Brush, E. J. (2019). Can chemistry be a central science without systems thinking? *Journal of Chemical Education, 96*(12), 2679–2681. https://doi.org/10.1021/acs.jchemed.9b00991

McNeill, K. L., Katsh-Singer, R., Gonzalez-Howard, M., & Loper, S. (2016). Factors impacting teachers' argumentation instruction in their science classrooms. *International Journal of Science Education, 38*(12), 2026–2046. https://doi.org/10.1080/09500693.2016.1221547

Melese, S. (2019). Instructors' knowledge, attitude and practice of differentiated instruction: The case of College of Education and Behavioural Sciences, Bahir Dar University, Amhara Region, Ethiopia. *Cogent Education, 6*(1), Article 1642294. https://doi.org/10.1080/2331186X.2019.1642294

Ministry of Education. (2017). *The national teacher education curriculum framework*. https://t-tel.org/download/national-teacher-education-curriculum-framework/

Mpuangnan, K. N., & Adusei, O. (2021). Implementation of standard-based curriculum in Ghana: The concerns of basic school teachers. *International Journal of Education and Research, 9*(3), 53–66.

Musset, P. (2010). *Initial teacher education and continuing training policies in a comparative perspective: Current practices in OECD countries and a literature review on potential effects* (OECD Education Working Papers, No. 48). OECD Publishing. https://doi.org/10.1787/5kmbphh7s47h-en

Naah, A. M., & Osei-Himah, V. (2026). Performance-based assessment of pre-service teachers' planning skills in selected topics in the chemistry curriculum for colleges of education in Ghana. *African Journal of Empirical Research, 7*(1), 522–536. https://doi.org/10.51867/ajernet.7.1.46

Nnachi, R. O. (2011). Psychological approach for the guidance of new science teachers in curriculum implementation. *Journal of Curriculum Studies, 18*, 241–250.

Licensed Under Creative Commons Attribution (CC BY-NC)

Ofem, U. J., Orim, F. S., Edam-Agbor, I. B., Amanso, E. O. I., Eni, E., Ukatu, J. O., Ovat, S. V., Osang, A. W., Dien, C., & Abuo, C. B. (2025). Teachers' preparedness for the utilization of artificial intelligence in classroom assessment: The contributory effects of attitude toward technology, technological readiness, and pedagogical beliefs with perceived ease of use and perceived usefulness as mediators. *Frontiers in Education, 10*, Article 1568306. https://doi.org/10.3389/feduc.2025.1568306

Okorie, E. U., & Akubuilo, F. (2013). Towards improving quality of education in chemistry: An investigation into chemistry teachers' knowledge of chemistry curriculum. *International Journal of Emerging Science and Engineering, 1*(9), 30–34.

Olanrewaju, G. S., Adebayo, S. B., Omotosho, A. Y., & Olajide, C. F. (2021). Left behind? The effects of digital gaps on e-learning in rural secondary schools and remote communities across Nigeria during the COVID-19 pandemic. *International Journal of Educational Research Open, 2*, Article 100092. https://doi.org/10.1016/j.ijedro.2021.100092

Oluwatayo, J. (2012). Validity and reliability issues in educational research. *Journal of Educational and Social Research, 2*(2), 391–400.

Pektaş, Ö., & Pesen, A. (2021). Developing curriculum awareness scale (CAS): The study of validity and reliability. *International Journal of Current Approaches in Language, Education and Social Sciences, 3*(1), 115–132.

Potera, I., & Shallah, L. (2019). Teachers' attitude towards new curriculum. *Education Sciences, 14*(1), 52–69. https://doi.org/10.12739/NWSA.2019.14.1.1C0689

Rakes, G., & Dunn, K. (2015). Teaching online: Discovering teachers' concerns. *Journal of Research on Technology in Education, 47*(4), 229–241. https://doi.org/10.1080/15391523.2015.1063346

Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research, 75*(2), 211–246. https://doi.org/10.3102/00346543075002211

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press.

Rowland, T., Turner, F., Thwaites, A., & Huckstep, P. (2009). *Developing primary mathematics teaching: Reflecting on practice with the knowledge quartet*. Sage Publications.

Santiago, C. T. (2019). Teacher's affective attitude and its effect on their organizational commitment. *International Journal of Sciences: Basic and Applied Research, 48*(3), 78–91.

Saunders, B., Kitzinger, J., & Kitzinger, C. (2015). Anonymising interview data: Challenges and compromise in practice. *Qualitative Research, 5*, 616–632. https://doi.org/10.1177/1468794114550439

Schleppegrell, M., & Christie, F. (2018). Linguistic features of writing development: A functional perspective. In C. Bazerman, A. N. Applebee, V. W. Berninger, D. Brandt, S. Graham, J. V. Jeffery, P. K. Matsuda, S. Murphy, D. W. Rowe, & M. Schleppegrell (Eds.), *The lifespan development of writing* (pp. 111–150). National Council of Teachers of English.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4–14.

Snyder, R. R. (2017). Resistance to change among veteran teachers: Providing voice for more effective engagement. *International Journal of Educational Leadership Preparation, 12*(1), Article EJ1145464.

Suzan, W., & Kazaara, A. G. (2023). The impact of western education on social economic development of communities in Uganda: A case study of Wakiso Town Council, Wakiso District. *International Journal of Academic Multidisciplinary Research, 7*(4), 185–191.

Tajik, O., Golzar, J., & Noor, S. (2024). Purposive sampling. *International Journal of Education and Language Studies, 2*(2), 1–9. https://doi.org/10.22034/ijels.2025.490681.1029

Tetteh, A., & Khumi-Agbasa, P. (2019). Basic school teachers' knowledge in fundamental curriculum concepts and curriculum development process in Ghana. *Journal of Education and Practice, 10*(9), 94–105.

Thura, M., & Khaing, N. N. (2020). Primary teachers' attitudes towards new curriculum. *Journal of Myanmar Academy of Arts and Sciences, XVIII*(9B), 157–184.

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