Research Article

CHALLENGES IN CHEMISTRY TEACHING: A CASE STUDY OF ACADEMIC ISSUES AND STUDENT BEHAVIOR

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ABSTRACT

This case study was conducted to identify the challenges faced by chemistry teachers in the academic and behavioural aspects of students during the teaching and learning process. The studies used a mixed-methods approach by combining quantitative questionnaires and semi-structured interviews as the primary instruments. A total of 12 chemistry teachers were respondents to the questionnaire, while two of them were involved in in-depth interviews. The validity of the instrument is determined through a percentage of expert agreement that reaches 89%, while the reliability of the questionnaire obtains an Alpha Cronbach coefficient value of 0.962. Quantitative data were analysed using SPSS to obtain mean and standard deviations, while qualitative data were analysed thematically. The findings of the study showed that the academic problems of chemistry teachers were at a low level (M=1.23, SP=0.19), as well as students' behavioural issues (M=1.32, SP=0.15). The analysis of the interviews, however, highlighted critical challenges such as curriculum changes, assessment workloads, low student motivation, and classroom discipline issues. This study provides the implication that chemistry teachers need ongoing support through professional training, reduction of administrative workload, as well as strategic interventions to increase pupil motivation. The results of the study are expected to serve as a reference for policymakers, school administrators, and the education community to strengthen chemistry teaching practices more effectively.

Keywords: teaching challenges, chemistry teachers, academics, pupil behavior, case studies

INTRODUCTION

Teaching chemistry in high school is often considered challenging because of its complex nature and requires integration between the macroscopic, microscopic, and symbolic levels to achieve a thorough understanding. Recent studies have found that teachers need to overcome difficulties in conveying abstract concepts of chemistry that involve multiple levels of representation simultaneously, especially when students face confusion in understanding the transitions between those levels (Loh, Chong, Lee, & Listiani, 2024).

The effectiveness in the classroom depends highly on the ability of teachers to adapt teaching approaches according to the level of ability of the students and to build a conducive and inclusive learning environment. Chemistry teachers need to master different teaching

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approaches such as "differentiated instruction" to meet the needs of classes with mixed levels of achievement (Salleh, Rauf, & Saat, 2022). Teachers also play an important role as a catalyst for students' motivation to increase active involvement in learning, especially in challenging subjects such as chemistry.

However, studies show that many chemistry teachers still face various academic challenges that affect teaching effectiveness. Among them include high workload, difficulty in implementing continuous assessments, curriculum shifts such as from KBSM to KSSM, as well as constraints in implementing more innovative and student-centred pedagogical strategies. Ismail, Salleh, and Nasir (2019) stated that high workloads coupled with inadequate teaching time have resulted in difficulties for teachers to carry out STEM approaches in the classroom effectively. Additionally, Ee (2021) adds that teachers struggle to adapt because of syllabus changes and inadequate resources regarding this; s Salleh et al. (2022) referring to the necessity of ongoing support for a flexible pedagogical approach.

The students' attitudes were one of the most important factors affecting chemistry learning. Lack of attention, incomplete work assignments, not coming to class and trouble making noise are all typical classroom occurrences. Negative student attitude is one of the major challenges to efficient chemistry instruction in developing countries as mentioned by Berhe and Tesfemariam (2024). Kanapathy, Lee and Mokhtar (2019) also discovered that lack of interest and peer pressure are some of the contributory factors to students' unproductive attitudes in science classes, chemistry inclusive. This not only affects the teaching and learning process but also brings about more job stress of teachers and less teaching enthusiasm.

While there are many international studies that discuss academic challenges and student behaviour in science education studies that focus specifically on chemistry teachers are still limited, particularly in the Malaysian context. Studies by Salleh et al. (2022) and Ismail et al. (2019) highlight issues such as teacher workload, the need to tailor teaching and learning strategies to students of various ability levels, and constraints in chemistry classroom management. However, most of these studies were quantitative and paid less attention to teachers' experiences in depth. Therefore, this study was conducted to explore the problems faced by chemistry teachers in terms of academics and student behaviour through a comprehensive case study approach. The findings are expected to provide a more holistic picture of the reality of chemistry teaching and offer practical implications for teacher professional development and improvement of education policies at the secondary school level.

LITERATURE REVIEW

Challenges in teaching chemistry have been widely discussed in the current literature, including in Malaysia and other developing countries. Recent studies have shown that abstract and complex chemical properties, especially in microscopic aspects such as atomic structure, chemical bonds, and energy changes, are among the major barriers to pupil understanding (Loh, Chong, Lee, & Listiani, 2024). Many students have difficulty visualizing these concepts and cannot relate them to the macroscopic phenomena they see daily.

Pedagogical constraints such as overly teacher-centered teaching and memorization-based approaches have been ineffective in improving students' conceptual understanding in chemistry. Traditional pedagogy neglects the active participation of students and does not lead to meaningful learning that is necessary for mastering advanced topics, as stated by Berhe and Tesfemariam (2024). This problem highlights the importance of the adoption of a more contextual, interactive and inquiry-based pedagogical approach.

From a pedagogical perspective, novice and experienced teachers experience unique problems in teaching standards such as mastering science process skills, planning lessons systematically, and handling heavy and discrepant workloads. A study by Salleh et al. (2022) reveal that chemistry teachers need to manage the tension between the diverse classrooms and hence the requirement to adjust teaching methods and time-pressures during daily practice.

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The quality of chemistry education is further comprised by school environmental factors such as lack of facilities, shortage of resources, and administrative pressures. Ismail, Salleh and Nasir (2019) mentioned that teachers have difficulty in implementing the inquiry-based pedagogy without support and materials. Salleh, Rauf and Saat (2022) have also reported a positive work environment results in high job satisfaction among the teachers, whereas a high workload leads to emotional exhaustion and intention to quit the profession.

Besides academic challenges, student behaviour has become a central focus in current research. Teachers may often face problems with habitual student absence and disrespect. Berhe and Tesfemariam's (2024) research shows that these adverse behaviors are caused by students' disinterest in science and a non-supportive learning environment.

In addition, Kanapathy, Lee, and Mokhtar (2019) stated that student behavior is strongly influenced by internal factors such as low motivation, psychological stress, as well as socioeconomic constraints, besides being influenced by external factors such as a passive school climate and an unconducive peer culture. This conduct hinders teaching and learning, plus it affects teachers' emotions and good chemistry instruction.

Overall, the current literature shows that chemistry teaching is influenced by two main interrelated factors: (i) academic challenges involving pedagogical aspects, curriculum changes, teacher workloads, and limited school resources and facilities; and (ii) issues of pupil behaviour that interfere with the smooth teaching and learning process. Studies by Salleh, Rauf and Saat (2022) and Ismail et al. (2019) prove that these two aspects reinforce each other, where high workloads and pedagogical pressures can affect teachers' ability to effectively address pupils' behaviour.

However, studies that integrate these two dimensions in depth in chemistry teachers in Malaysia are still limited. Previous studies have focused on only one aspect either academic or behavioural, without looking at the interaction between the two holistically. Therefore, this article seeks to fill the void by investigating these two aspects in depth through a case study focusing on the actual experiences of chemistry teachers in their everyday classroom.

METHODOLOGY

Research Design

A mixed-method case study method was used in this research to understand the issues faced by chemistry teachers collectively. This configuration helps triangulation, therefore increasing the trustworthiness and precision of results. Creswell and Plano Clark (2018) suggested that this design is optimal for holistic depiction, combining numerical data with the voices of participants. Similar method was utilized by Salleh et al. (2022), combining questionnaires and interviews, to determine the teaching strategies of chemistry teachers across different skill levels in science education.

Sample

The data in this study was collected from 12 chemistry teachers who were respondents to the questionnaire and two of them took part in an in-depth interview. All the teachers are from a specific district in Malaysia. This choice was determined by teachers' availability to be interviewed and their representation of different school settings in the same district.

Instruments

Two types of instruments were used in the study:

1. Quantitative questionnaire – constructed based on the items adapted and derived from previous studies that investigated teachers' difficulties in science education, and it is then changed to the context of local chemistry education. This survey was modified from Alsharari's (2016) study which dealt with work stress, teaching

constraints and class management problems among new science teachers in Saudi Arabia.

2. Semi-structured interviews – aimed at obtaining richer qualitative data about how teachers have actually handled academic problems and pupil behaviour in chemistry lessons. Salleh, Rauf and Saat (2022) mentioned the interviews helped in understanding the challenges in teacher pedagogy in perspective.

Expert agreement (89%) confirmed the instrument's validity, suggesting its content aligned well with the study's goals. Reliability of the questionnaire was estimated by Alpha Cronbach coefficient (α = 0.962), showing good reliability and consistency of measuring factors associated with challenges facing teaching chemistry.

Data Collection Procedure

Questionnaires were distributed to all respondents, while interviews were conducted face-to-face and recorded with respondents' consent. All techniques are carried out with research ethics - informed consent, anonymity of identity and academic data purposes used.

Data Analysis

Descriptive statistics such as mean score, SD, and frequency distribution were analyzed by SPSS software (version 27.0) for quantitative data. The interpretation of the mean score is based on a three-level scale adapted from Noraini Mohd Noh (2012), namely low (1.00–2.33), medium (2.34–3.66), and high (3.67–5.00).

Meanwhile, qualitative data were analyzed using the framework-guided thematic analysis method proposed by Braun and Clarke (2021). This method involves six main phases: (i) reading and familiarization with the data, (ii) initial coding, (iii) theme search, (iv) theme review, (v) theme naming and definition, and (vi) report writing. This approach is ideally used to analyze complex and diverse teacher narratives, especially in the study of teacher experience-based education.

DATA ANALYSIS AND FINDINGS

The data analysis of this study is divided into two main parts, namely quantitative findings from questionnaires and qualitative findings from interviews. These two data were analysed triangulated to provide a comprehensive picture of the academic challenges and behavioural issues faced by chemistry teachers in the classroom.

Quantitative Findings

The results of the questionnaire showed that pupils' academic and behavioural challenges were at an overall low level (M=1.28, SP=0.17). Details of mean, standard deviations, and interpretations are shown in Table 1.

Table 1

Min, standard deviation, and interpretation for the construct of chemistry teacher's problems

Construct	Min	Standard Deviation	Interpretation
Academic	1.23	0.19	Low
Pupil behaviour	1.32	0.15	Low
Overall	1.28	0.17	Low

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Although in aggregate both constructs are at low levels, an item-by-construct analysis reveals some critical issues. Table 2 details the quantitative findings for academic constructs.

Table 2

Frequency and percentage scores for chemistry teachers' academic problems

Academic items	Score (n=12)	Percentage (%)
Higher teacher teaching workload	9	75.0
Sufficient knowledge of the subject of chemistry	10	83.3
Lesson plan is provided systematically	11	91.7
Curriculum changes (KBSM → KSSM) are challenging	7	58.3
Continuous assessment is burdensome	5	41.7

The findings showed that while most teachers rated themselves as mastering the content of chemistry (83.3%) and being able to provide systematic Lesson Plan (91.7%), almost three-quarters of respondents (75%) reported teaching workload as a major issue. In addition, more than half of teachers (58.3%) also stated that the transition of the curriculum from KBSM to KSSM poses challenges in implementing teaching and learning.

For the construct of pupil behaviour, Table 3 shows that all teachers reported four behavioural issues that occurred with 100% frequency.

Table 3

Frequency and percentage scores for pupils' behavioural problems

Student behavior items	Score (n=12)	Percentage (%)
Not completing assignments	12	100.0
Sleep during teaching and learning	12	100.0
Leaving class without permission	12	100.0

Although the mean score of the students' overall behaviour was low (Table 1), all teachers pointed out that repetitive behaviours such as not completing assignments, sleeping during teaching and learning, and leaving class without permission occurred consistently. This shows that the mean value alone is not enough to reflect the real reality that teachers face in the classroom.

Qualitative Findings

The findings of in-depth interviews with two chemistry teachers reinforced the quantitative results by providing context and a more detailed understanding. Four major themes have been identified:

1. Curriculum Transition (KBSM to KSSM) - Teachers noted the challenges of adapting to the new syllabus, which required additional references and peer support.
   "The new KSSM syllabus was quite challenging, I had to ask questions with senior teachers and refer to Telegram groups to understand the best approach." (GI1)

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2. Assessment and Project Workload - The implementation of PBDs and learning-based projects increases work stress as it requires additional time and material costs.
"Projects require additional materials and more time, whereas teaching and learning schedules are very tight." (GI2)

3. Low Student Motivation - Low-performing students are passive and fully dependent on teachers.
"Weak students don't want to try, they just wait for an answer from the teacher." (GI2)

4. Recurrent Behavior Issues - Discipline problems such as sleeping in class, skipping classes, and not completing assignments are common.
"Sleeping and skipping are normal, it's hard to wake them up if they're really not interested." (GI1)

Findings Synthesis

A combination of quantitative and qualitative analysis shows that although aggregate scores are at a low level, specific issues at the item level and teacher experience present much more complex challenges. This is shown in Table 3.

Table 4 shows that the academic challenges faced by teachers (new curriculum, workload, assessments, projects, pupil motivation) interact directly with pupils' behavioural issues (not completing assignments, sleeping, leaving class without permission). This relationship creates a cycle of problems that reinforce each other, thus affecting the effectiveness of chemistry teaching and learning.

Table 4

Synthesis of academic challenges and student behavioural issues in chemistry teaching

Academic Challenges of Chemistry Teachers	Student Behavior Issues
High teaching workload	Not completing assignments (100%)
Curriculum exchange (KBSM → KSSM)	Sleep while teaching and learning (100%)
Continuous assessment is burdensome	Leaving class without permission (100%)
Project Based Learning (PBL)	Passive attitude & high dependence
Low pupil motivation	

Overall, the analysis of the data shows that challenges in chemistry teaching cannot be seen only at the mean score level, as the issue per item and the teacher's narrative provide a more critical picture. Although the quantitative findings show a low level, teachers' experiences through interviews prove that the actual problems are more complex, profound, and repetitive. Therefore, this study emphasizes the need to reduce teachers' academic workload, support curriculum transitions, as well as implement more effective student behavior management strategies.

DISCUSSION

This study aims to identify the academic challenges and behavioural issues faced by chemistry teachers in the teaching and learning process. Although the quantitative analysis showed that the average scores for both constructs were at low levels (Table 1), the findings per item (Table 2 and Table 3) as well as the interview analysis showed the existence of serious specific issues. This shows the need to interpret quantitative findings carefully with the support of qualitative data so that there is no reduction in meaning.

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Academic Challenges of Chemistry Teachers

The findings of the study show that the issue of teaching workload and curriculum transition is the most significant challenge (Table 2). Although teachers have mastered the content and preparation of Lesson Plan at a good level, they face difficulties in managing additional demands such as Classroom Assessment (PBD), learning-based projects (PBL), as well as curriculum changes from KBSM to KSSM.

This issue is in line with the findings by Ismail, Salleh and Nasir (2019) who pointed out that science teachers, especially chemistry teachers, often face a high assessment burden and continuous curriculum changes, thus affecting the focus on pedagogical aspects and emotional well-being. A study by Kanapathy, Lee and Mokhtar (2019) also showed that stressful working conditions, including administrative burden, lack of planning time, and high expectations from management, have the potential to speed up teacher burnout and reduce teaching effectiveness.

In addition, the findings of the interviews show teachers need ongoing professional support to help them adapt to curriculum changes and pedagogical innovations. This coincides with the recommendations of Salleh, Rauf and Saat (2022) who assert that continuous professional development that is focused and contextual can help teachers integrate new teaching strategies more effectively in their teaching and learning.

Student Behavior Issues

Student behavior issues emerged as the crucial factor that interfered with the effectiveness of chemistry teaching and learning. All teachers reported consistent problems of not completing assignments, sleeping during teaching and learning, and leaving class without permission (Table 3). Despite the low overall mean score, these findings show a recurring pattern of negative discipline that has the potential to affect teacher motivation.

These findings are in line with the study of Berhe and Tesfemariam (2024) which emphasized that pupil behavior disorders have a direct impact on the reduction of effective teaching time, especially in science classrooms that require in-depth conceptual explanation. In a local study, Kanapathy, Lee and Mokhtar (2019) also reported that low levels of pupil motivation contributed to an increase in negative behaviors such as reluctance to ask questions, absenteeism, and passivity.

In this study, teachers reported that low-performing pupils was less proactive and overly dependent on the teacher in the learning process, which indirectly hindered the development of meaningful learning experiences. This situation is also supported by Salleh, Rauf and Saat (2022) who found that students' intrinsic motivation plays an important role in determining their level of involvement during teaching and learning, especially in subjects such as challenging chemistry.

Interaction between Academic Challenges and Student Behavior

The synthesis of findings (Table 4) shows a direct interaction between teachers' academic challenges and student behavioural issues. For example, the workload of teaching and assessment not only affects teachers' preparation time, but also indirectly reduces the opportunity to plan more engaging teaching and learning activities. This condition in turn results in students losing concentration and showing negative behaviors such as sleeping or not completing assignments.

Similarly, the curriculum shift puts pressure on teachers as they have to adapt to the new syllabus, while students face difficulties in understanding abstract chemical concepts, thus showing passive behaviour. This illustrates that teacher challenges and student behavioural issues form a reinforcing cycle that requires comprehensive intervention.

This study supports findings from the current literature that emphasizes that chemistry teaching demands integration between three levels of understanding—macroscopic,

microscopic, and symbolic—to ensure a thorough understanding of concepts. According to Chandrasegaran, Treagust and Mocerino (2017), students' failure to connect these levels often leads to misunderstandings of concepts and consequently affects their interest in chemistry subjects. This condition also contributes to the emergence of inappropriate behavior in the classroom such as refusal to answer questions, loss of concentration, and extreme dependence on teachers.

These findings reinforce the view of Berhe and Tesfemariam (2024) that weaknesses in building relationships between scientific representations may be a major factor hindering the effectiveness of chemistry teaching and learning, especially among low-performing students.

The results of this study have several important implications:

1. The professional development of chemistry teachers should emphasize teaching and learning management strategies that can address the challenges of the new curriculum and the burden of assessment.
2. Education policy needs to review the burden of continuous assessment so that teachers can focus on more meaningful teaching and learning.
3. Pupil behaviour management strategies such as the use of classroom routines based on positive behaviour support and control of device use need to be strengthened.
4. Students' motivation should be enhanced through contextual and inquiry-based approaches that can increase their interest and active involvement in chemistry learning.

CONCLUSIONS

This case study shows that challenges in teaching chemistry involve a combination of closely related academic and behavioural factors. While quantitative analysis shows a low level of challenge, per-item findings and interviews reveal real, more critical issues. Teachers face high workloads, curriculum shifts, and constant assessment demands, while students frequently exhibit disruptive behaviours such as not completing assignments, sleeping while teaching and learning, and going out without permission. These findings assert that the effectiveness of chemistry teaching depends not only on teachers' pedagogical strategies, but is also influenced by systemic and psychosocial factors in the school environment. Hence, strengthening chemistry teaching requires a holistic approach that involves teacher professional development, more balanced workload management, as well as integrated strategies to address student behaviour.

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