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Chemistry private tutoring in Malaysia

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ABSTRACT

The unsatisfactory result obtained by Malaysian secondary students in international assessment has caused the Ministry of Education to put much effort into structuring the curriculum. Variety of teaching pedagogies has been suggested but not all the approaches are applicable due to many constraints. It leads students to enroll in extra private tutoring classes after their regular school hours. This research aimed to identify the reason students attend chemistry private tutoring, to explore the teaching pedagogies used in chemistry private tutoring, and to identify the perceptions of students on the pedagogies used in chemistry private tutoring. This is an exploratory qualitative study that is conducted among six tutors and five students in Malaysia. The result was analyzed through thematic analysis. Interestingly, the study has indicated that despite improving their academic result, students attend tuition to enhance their understanding and knowledge of chemistry as they were ably exposed to a variety of teaching methods. A new insight on pedagogies used in private tutoring lessons was determined, such as deductive learning, inquiry-based teaching and contextualization. It is found that student's learning needs are highly emphasized in tuition classes. Students experience more meaningful learning and obtain interesting learning experiences in tuition.

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1. INTRODUCTION

The well-recognized international assessment trends in international mathematics and science study (TIMSS) and program of international students assessment (PISA) has revealed that Malaysian secondary students have achieved unsatisfactory result (lower than the mean score) [1]. Ministry of Education Malaysia has realized that the knowledge that students have obtained and mastered is no longer enough to cope with the needs for our country's future development. It required students to creatively applied the knowledge to unpredictable challenges faced and be able to provide reasonable justification [2]. A variety of teaching pedagogies has been introduced to enhance the student's learning experience in the chemistry classroom. However, some students choose to enroll in private tutoring lesson that is offered outside of their regular schooling hour for several reasons.

First, the traditional lecture-based classroom is still being implemented in science classes and has shaped students to become passive learners [3]. Teaching methods that are commonly used include lecturing, answering questions, explaining important notes, and completing worksheets. More teacher-centered learning focusing on the delivery of knowledge from the textbook has led to little student participation [4]. This situation results in the lack of practicability of their knowledge in their daily life, as they learn for the sake of

knowing and understanding the theoretical parts of the concepts and theories. Furthermore, the issue of large class size has also been emphasized as one of the challenges in teaching and learning science subjects [5], [6] In Malaysian national school, the average class size ranges from 25 to 40 students with one teacher. Hence, teachers are not able to give individual attention to each of the students. Individual needs are also not able to cope fully due to time constraints and the large workload of teachers [7].

In school, teachers also teach students the technique of answering examinations and important facts or concepts to be noted. Thus, students learn to memorize facts or concepts to answer examination questions, without really make effort to find out the working theory or principle of scientific knowledge [8]. This is similar to another study by Dzahari and Kadum [9] which found that students memorized most of the formulas and were assigned related questions, but they were confused to pick the suitable formula sometimes. Learning science became unmeaningful to them in school. Hence, students opt for other options or extra lessons such as private tutoring lessons, which they believed help them to fulfil their learning needs.

The enrolment of tuition for science subjects has gained popularity as they are expected to get better grades in their national examination [10], [11]. Research conducted by Bray *et al.* [12] has found that as high as 89.5% of grade 9 and 97.3% of grade 12 students declared that students enroll in private tutoring to prepare for the national examination. [13] found similar result which shows 76.3% of grade 9 students and 92.1% of grade 12 students enroll in tuition to improve examination score. Students also opt for private tutoring to expose themselves to a different pedagogical method. A report by Bray *et al.* [12] found that 87.6% of the respondent claimed that their tutor teaches differently from their mainstream teaching by providing more exercise to them. Furthermore, they have better interaction with their tutor which provides them with better explanations [14].

Students required a change in terms of pedagogy that not only improve their academic result but also cope with their learning needs, as well as deal with their curiosity while deepening scientific knowledge. Meanwhile, research about the impact of chemistry private tutoring in fulfilling students' needs in Malaysia is still in the infancy stage. Hence, it is crucial to conduct research to obtain a deeper understanding of how private tutoring in chemistry is conducted in the Malaysian context and whether it can successfully cater for the needs of students.

This research aimed to obtain deeper insight into the perceptions of students and the pedagogies used in private tutoring lessons. Thus, the objectives of the study are: i) To identify the reason students, attend chemistry private tutoring; ii) To explore the teaching pedagogies used in chemistry private tutoring; and iii) To identify the perceptions of students on the pedagogies used in chemistry private tutoring.

2. RESEARCH METHOD

This study utilized a qualitative case study approach through interviews to study the experience and behavior of students and tutors in private tutoring lessons [15], [16]. According to Baškarada [17], a case study research helps to obtain a comprehensive understanding of a research problem under a community or an organization, in this case, the chemistry tutoring community. A case study allows for an intensive analysis of the needs of tutoring as well as the pedagogies that tutors used in chemistry private tutoring lessons. The interview approach has been used in this study to obtain a deep holistic view from the tutors and tutees on their experience of tutoring. This study lasted for three month and the interviews were conducted through the online application Google Meet due to the pandemic of COVID-19. Each interview session last for 20-30 minutes and was recorded.

The sample of the research this research includes tutors who teach group tuition in tuition centers and students who received tuition in the same setting in the state of Johor. Snowball sampling starts with the researcher selecting individuals that are willing and convenient to carry out the research [18]. There were a total number of six tutors, three females and three males with tutoring experience of three years and above participating in this research. They were all tutors that taught in registered tuition centers in Johor Bahru, teaching the chemistry' software project management or SPM syllabus. Meanwhile, five students consisting of four females, and one male participated in the research, who were all SPM candidates that have received chemistry tutoring lessons in registered tuition centers in Johor Bahru.

Interview questions have been generated considering the important construct identified from the literature and the natural setting of the tuition from the casual conversation that was conducted earlier. Interview questions were built according to relevant constructs that have been identified through literature. Then, interview protocols have been constructed and used by all the participants in this study to ensure credibility of the study. The interview questions have undergone pilot testing by two tutors and two students who are not participants in this research. Meanwhile, the instrument was also validated by two experts (chemistry teachers) who are familiar with the national curriculum and teach in national secondary schools in Malaysia.

The first objective is to identify the reason students need to attend chemistry private tutoring. There were two questions posed to tutors and students to explore their tuition needs. The second objectives generate interview questions focus on the pedagogical practices used in tutoring lessons and how helpful their tuition class are in fulfilling the students' needs. The sample is tutors. The third objective is to identify the perceptions of students on the pedagogies used in chemistry private tutoring. The interview questions focus on the pedagogies and the effectiveness of tuition perceived by students. The instrument used is tabulated in Table 1.

Table 1. Instrument used in the study

Research objectives	Interview questions	Sample
Necessity/determinants of tutoring	1. Why do you think students enroll in your tuition class?	Tutors
	2. Why do you choose to enroll in private tutoring lessons?	Students
Teaching pedagogies used in chemistry private tutoring	1. What are the common pedagogies you've applied in your tuition class?	Tutors
	2. How does your class complement the regular lesson being conducted in mainstream schooling?	
	3. How well do you think that your lesson has helped students with their learning needs?	
Perceptions of students of the pedagogies used	1. Do you think your tutor makes the subject easier after attending his/her lesson?	Students
	2. What is the method used by your tutor that you think it's more suitable for delivering knowledge?	
	3. What is the main difference between the teaching method of your tutor and your school teacher?	
	4. How do you think tutoring benefits you?	

The data was collected for three months, from April to June 2021. Once the themes obtained are saturated and repetitive, data analysis was carried out. It was done by transcribing the recording, including the questions posed by researchers. The sequence of the data obtained was transcribed in order. Then, data that does not comply with the research objective was filtered out. Data were then coded according to the relevant theme when similarities were identified [19], [20]. Investigator triangulation was done by involving other experts who teach chemistry and also possessed well-structured knowledge about the national curriculum to validate the data [21]. Two other investigators have listened to the recording and analyzed the data. The themes generated by each researcher were cross-checked and only similar themes were used. Validation of data was carried out through inter-rater reliability and Cohen's kappa coefficient (κ) was calculated.

3. RESULTS AND DISCUSSION

There are three research questions in this research, where the first research question aimed to identify the reason why students need to attend chemistry private tutoring. The second research question explores the pedagogies used in chemistry private tutoring lessons, while the third research question aimed to understand the perceptions of students on the pedagogies used. The first research question consists of two questions, the second research question consists of three questions and the third research question consists of four questions. The theme generated under each research question is shown in Table 2.

Table 2. Themes generated under each research question

Research questions	Themes	
Needs of students to enroll in chemistry tuition	– Language usage.	– Enhance understanding and knowledge acquirement.
	– Obtain better understanding.	
	– Improve examination result.	– Unsuitable teaching pace of teacher in school.
Teaching pedagogies in chemistry private tutoring	– Conventional instructional teaching.	– Real-life connection.
	– Visualization.	– Clarification of concepts.
	– Deductive method.	– Explain in other languages.
	– Inquiry-based teaching.	– Exposure to experiment.
	– Provide extra consultation.	
Perceptions of students on the pedagogies used by their tutor	– Opportunities to ask questions.	– Usage of past year's question.
	– A unique way of explanation.	– Practical experiments.
	– Focus on lesser students.	– Contextualization.
	– Teaching according to pace.	– Enhance understanding.
	– Create own notes and questions.	– Improve academic results.
	– Usage of multimedia.	

3.1. Needs of students to enroll in chemistry tuition

There are two questions posed to students and tutors to identify their needs to enroll in private tutoring lessons. The first question investigates whether the tutors are aware of their students' needs to come for tuition. There are two themes generated through the interview which are the language used and to obtain a better understanding. The common response from the respondents has stated that their tutees' school teacher conducts the lesson in Malay, which they are not so familiar with. They preferred their tutor who can teach them in their mother tongue. Respondent A1 stated that:

> "*School teacher was conducting their lesson in Bahasa Malaysia (BM). I explain the theory and concept in Mandarin but read questions in the handout in English. I think this method helps them to have more understanding.*"

This result is similar to Kenayathulla [22] who stated that BM has been used as a medium of instruction in national schools. Students in other ethnic groups who speak their native tongue at home might need to enroll on tuition to seek a tutor who can explain in their mother tongue. Two of the respondents opine that they as a tutor has provided students with a better understanding of chemistry knowledge through their experiences in their tutoring lesson. One respondent highlighted that:

> "*I can provide a better explanation based on the student's perception, as I usually recall my problem during student time while dealing with a certain topic. Of course, students can grab a better understanding of the knowledge after this.*"

Tutors believed that their students come to them as they can utilize a variety of pedagogy in helping them to obtain a better understanding of chemistry knowledge. Providing a thorough understanding of the knowledge has strengthened their knowledge base, further assisting them in using the knowledge accurately [23]. Tutoring lesson that strives to use multiple methods to fill their knowledge gaps is crucial in helping students to construct their learning in their later stage of life.

The second question understands the need for tutoring from the student's perspective. Through the interview, there were three themes generated namely to improve examination results, enhance their understanding and knowledge and teaching pace of school teachers. There were 100% of the respondents commented that they enroll in private tutoring lessons in chemistry to improve their examination results since their result in the national examination provides students with a higher possibility to enroll in their desired course at university. The similar result obtained from their tutors, students mentioned that one of the goals in attending tuition is to help them to gain a better understanding of the subject matter. Also, 60% of the respondents commented that the teaching pace of school teachers is either too fast or too slow. The respondent has stated that:

> "*… the school teacher sometimes will teach a little bit slower because there are different students in the class. Some are a little bit slower, so they need to follow their pace. Yeah, as result, the rest of us are also slowed down.*"
> "*And also like, I feel like this school schedule is a bit too short for certain subjects, you know, like, it's a bit too cramped with too many subjects going on. And then there's limited time and all that.*"

Bray *et al.* [12] found out that school teachers often allocate time for the topic by dividing textbook content along the semester. However, nearly half of the teachers indicate that they are not able to finish the content, while teachers who can finish the content have not delivered it efficiently. The result indicates that students prefer the flexible teaching pace offered by tutors according to their mastery, and tutors have longer instructional time by reducing absentees and remaining their tuition through public and school holidays.

3.2. Teaching pedagogies in chemistry private tutoring

There were three interview questions posed to respondents under this research question. This section investigates the perceptions of tutors on their pedagogies used according to students' needs to attend tutoring lessons. Two respondents highlighted that one of the ways they transfer their knowledge is through giving instruction.

> "*Students are given notes (which I did on my own) that are incomplete that contain blanks to be filled with the appropriate keywords, calculation working and/or scientific diagrams... …The concept would be explained first, making use of the writing board where required, followed by a discussion with the students to fill the correct keywords.*"

In the research by Brehm and Silova [24], it has been observed that both formal schooling and tutoring lessons provide similar instructional methods to students. However, the study revealed that they received individualized instruction due to smaller class sizes in tuition classes. Two respondents also use visualization such as video, pictures or drawing in explaining the abstract concept in chemistry. Respondent A2 highlighted the usage of animation while respondent A3 uses his drawing to explain the abstract concept of chemistry. A study raised the concern that students often faced difficulty in understanding the conceptual knowledge of chemistry, especially at the sub-microscopic level that encompasses atoms, molecules, electrons, and compounds [25]. The goal to overcome this difficulty could be done through the usage of visualization elements, such as chemical models and diagrams [26]. It was also found that deductive learning is used by first giving examples. Accompanied by conventional teaching, tutors would sometimes start the lesson by providing examples first to allow students to think, without explaining the concept to them at first.

In question 2, it was found that there are two respondents stated that as a tutor, they have a closer relationship with their students which permits extra attention and consultation given to each student. Tutors are willing to spend extra time with their students if they need more guidance. Most students are more comfortable contacting them to seek clarification or consultation, and they will provide clear and immediate feedback to them. The obtained result in this study corresponds to the findings of Bray *et al.* [12] students can ask if they are unclear in tutoring lessons, compare to schooling lessons where teachers are rushing to cover the syllabus. Due to sufficient time allocated, tutors are also able to provide them with clarification of concepts. One respondent stated that:

> "*I will ask them questions…. …After checking their previous knowledge, I would explain the concept at first and clarify their mistakes. It is different from school where they tell their procedure straight away.*"

A more real-life connection was also given to provide interest and better understanding to the students. The contextual teaching and learning approach allows students to bridge meaningful relationships using their knowledge, with the help of a teacher who creates a suitable learning situation [27]. By having a longer period of contact with students in tutoring lessons, the tutor could further elaborate on extra knowledge that is not mentioned in their textbook. Some tutor even incorporates experiment and demonstration in their lesson. The respondents have stated that the normal school hour might be packed, and their students do have not much time to expose to laboratory activities. However, it should be noted that this finding does not apply to all tuition centers, but only those centers that are well-reputed with a strong financial background can provide simple laboratory equipment and material for tutoring lessons.

Tutors believe that providing their lesson in multilanguage allows the students to have a clearer understanding, especially some terminologies that are not commonly used in life. One of the respondents opines that it helps to heighten their motivation to learn as they would apply their knowledge easily. They found learning interesting when they understand the mechanism from their perspective, further gaining confidence in them to overcome their difficulties in the learning process.

Most tutors have seen their students shows increased interest in learning chemistry, by comparing their student's learning situation before and after receiving tutoring lesson. 50% of the respondents stated that the verbal responses, either in terms of questions or answers provided by the students have also shown that their students have gained improvements in deepening their knowledge. Finally, there are also improvements in their academic results after receiving tuition.

3.3. Perception of students on the pedagogies used by their tutor

There were four interview questions posed to the students to obtain their perception of pedagogies used by their tutor that suit their needs in obtaining the knowledge and promote their improvement in achieving learning goals. In question 1, students highlighted that have more opportunities to ask questions and their tutor has focused on lessor students. Students perceived tuition classes in smaller sizes compared to the school classes helping the tutor to focus on each of the students and providing more interaction between tutor and tutees. The study demonstrates some correlation with the result of Subedi [28] which stated that due to smaller class sizes, tutors pay more attention and care to all students. Difficulties of students can be identified easily, and feedback would be given. Bray [14] adds that tutor in small group tutoring would put their focus on students.

Two out of five respondents comment on the ability of their tutor to adjust their teaching pace according to the student's pace and ability. Perhaps the tutor has a more flexible timing don't have to rush the syllabus. According to Bray, *et al.* [12] he found that the lacking of instructional time in school and teacher absenteeism has increased the demand for tutoring. Besides, the interviewees also commented that the lesson often goes rapidly by their teacher, limiting their chances to ask for clarification as compared to tuition.

The next question explored the perception of students on the pedagogical methods used by their tutor that suits their needs in obtaining the knowledge. Aligning with the tutor, students opine that usage of multilanguage to explain certain concepts, or in their mother tongue makes them understand the knowledge better. Besides, all the respondents voice out that their tutor uses multimedia such as PowerPoint or video and online quizzes in their lesson to enhance understanding and prepares them for examination. As mentioned by respondent B1,

> "*Visualization, for example, my tutor will show some video about the experiment that we seldom do in school, some principle about chemistry, like that … use PowerPoint presentation, and sometimes online quiz.*"

Using carefully chosen multimedia course elements, for instance, interactive experiments, animations and visualization of elements equipped with audio explanations allows students to understand abstract knowledge easily and encourage them to learn through different intelligence. Practice and past year questions are common to be used intuition. Extract from one respondent stated that,

> "*My tutor will often be very detail about some topic that needs more attention or the topic that will, more focus in exam …, the teacher will give more practice of some past year question about the topic.*"

Respondents think that using past year questions will enhance their problem-solving skills. It was suitable in helping them to understand the knowledge. In the tutoring process, tutors carefully examine their problem-solving steps and provide further support for them to ensure their students' progress according to the lesson [29]. Not only students' problem-solving skills are fostered, but they will also have wider exposure to practice their knowledge gained. In question 3, most students mentioned that they have got unique handouts from their tutor which can understand when the tutor teaches according to the notes.

> "*School teacher mostly teaches using exercise book, but the exercise books are just all words. There are no pictures, nothing. It is harder to understand from words and teacher explaining… Our tutor uses, they have like reference paper that we need to fill in, and pass year questions and exercise from other workbooks, and also have pictures that are easier to understand.*"

Some respondents are comfortable with how their tutor teaches and explain their handouts or gives them chance to fill the blanks with important keywords. Students find that this pedagogy was effective in enriching their learning strategies by diversifying knowledge-based on unique handouts given, and students need to produce output and write down on the handouts. Students also prefer their tutor who relates the abstract concept with a real-life example. Three respondents voiced out that their tutor provides them with opportunities to practice their knowledge learnt in the experiment, but the school teacher often explains the theory through the textbook. Students constantly feel fresh and interested as knowledge wanders around them, not only limited to learning through the textbook. Whenever they observe real-life phenomena (macroscopic level), they can relate to the conceptual knowledge learned under a different topic. Their understanding would be strengthened if they experience this knowledge frequently in their life, allowing them to build their perception and understanding.

As presented by the tutor, three of the respondents also appreciate the chance of exchanging knowledge with the tutor with lessor students involved. Students feel that this method has outperformed their school teacher in helping them to understand each student's learning needs, including their mental satisfaction. In question 4, Most respondents highlighted a common benefit of capturing a deeper understanding of chemistry knowledge. Four respondents proposed that a better understanding of the knowledge has heightened their interest in learning chemistry, and they are more motivated to learn it when it was interesting [30]. The data obtained also provide new insight into where students do not put examination grades as their only learning goals, yet they slowly develop the interest and joy of discovering chemistry knowledge and its application.

One of the indicators of achieving improvement in their achievement is through their examination grades [31]. The data obtained from two of the respondents suggested that revision provided in tutoring lessons improves their achievement in the examination. Surprisingly, not all students have related their academic results to the core benefits of tuition. It is most probably due to the perception of students on what are their aim to attend tuition, and what are their learning needs and their final target of learning. The successful construction of knowledge might not necessarily be portrayed through their examination score, it can also be shown through their self-improvement in the aspect of increasing interest, self-motivation, and application of knowledge.

4. CONCLUSION

The result from the interview shows that students enroll in tuition not only for improving their academic results but also to obtain a better understanding of the knowledge. Both tutors and students are aware that they need to obtain a better understanding of the knowledge at an appropriate pace. The research has found out that there were four main types of pedagogies being adopted which include conventional instructional teaching, visualization, inductive learning, and inquiry-based teaching. Tutors found that adopting the right pedagogies in tuition helps students to widen their exposure to the application of knowledge and heighten their interest in exploring the subject. It provides students with more opportunities of way to confront the knowledge, creates meaning to the knowledge gained and found their purpose in acquiring new knowledge.

Students have highlighted six pedagogies used by their tutor suitable and effective for them in obtaining the knowledge. This includes the language used for explanation, more practice through own questions and notes, usage of multimedia (visualization), practice through past year questions, exposure to practical experiments, and contextualization. The result shows that students are aware of how pedagogies used by tutors cater for their learning needs, as they are learning to cope with a higher thirst for knowledge and expectation of learning experience. Generally, students are satisfied with the pedagogies used in the tutoring lesson and found it effective in improving their academic achievement and scaffolding them towards achieving their learning goals.

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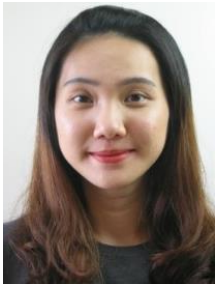

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