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# Teaching Methodology As A Cause Of Secondary Level Students' Learning Difficulty In Chemistry

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## Abstract

Chemistry, by its very nature, is highly conceptual. While much can be acquired by rote learning, real understanding demands the bringing together of conceptual understandings in a meaningful way. The objective of the study was to explore teacher-related causes for students' learning difficulty in chemistry. The nature of the research was descriptive and quantitative data collection procedures were used to conduct it. The population was comprised of all public and private school systems which have ten or more than ten branches in Lahore. Multistage sampling techniques has been used in it. Questionnaire was used as a data collection tool in the study. Cronbach's Alpha was 0.879 for reliability. The findings shows that the level of secondary students' perceptions about teaching methodology as a cause for difficulty in learning chemistry were at high level of agreement. It was recommended that adopting the teaching techniques while teaching the chemistry content according to students' interest (on the basis of psychological principles) may be easy to learn for students.

**Keywords**: Teaching methodology, students' learning, chemistry, secondary level

## Introduction

Before teaching chemistry in the classroom, teachers are expected to have a high degree of competency and knowledge in the topic. This will improve how well the subject is taught in secondary schools. Through their teaching methods, teachers need to cultivate their students' interest in and attitudes toward the subject. Teachers are supposed to support students' adjustment by matching course offers to students' stages of mental growth, understanding the fundamental social and cognitive issues they face, making course requirements relevant, and inspiring students to pursue the subject.

Despite the fact that chemistry is a fundamental science subject and that it is necessary for all scientific and technical endeavors, students only receive the lowest grades (Igbojinwaekwu, 2012). Students must actively create their own personal awareness and purpose when studying chemistry. One of the physical sciences that aids in describing and explaining our universe is chemistry. According to Ogwuleye (2014), effective chemistry instruction must be result-oriented and student-centered, and these goals can only be realized when the students are willing, the professors are in good spirits, and the students are being taught utilizing the right strategies and materials. (Nnoli, 2020).

Onyeachu, (2011) defined Teaching is fundamentally about assisting students in acquiring the quantity and quality of experience that will best foster the development of their potential as people. This indicates that there is contact between the teacher and the pupils that is planned out in the curriculum to effect change. Teaching is a rational act carried out in conformity with professional norms, according to Effiong and Edo (2008). In other terms, it refers to an action that a teacher takes that is inconsistent with established standards and guidelines (Adio, Oluwatosin, & Olatunde, 2021).

According to Reginald (1980), The way a teacher presents his information to the class and involves the pupils in the current activity is referred to as the methodology. Awoniyi in Okpala (2006) notes that a teacher must be several things in order to be effective, including a source of knowledge and a mentor, an organiser of learning opportunities, someone who can create an environment that is conducive to learning, a superior, and a consultant. To choose the best approach in a given circumstance, the teacher must be aware of the most recent developments in education. The teaching approach either facilitates or impedes learning. Chemistry teachers must employ effective methods to pique students' attention and support the development of positive attitudes for successful learning outcomes because the subject is one that the majority of students find intimidating (ODIRI, 2020).

In order to achieve chemistry's ultimate aims in the curriculum and the country's education strategy, it is necessary to apply the right techniques that can pique students' interest in learning about chemistry at all levels of our educational system. In addition to employing the proper techniques, effective chemistry instruction in schools greatly depends on the classroom and professional competencies of teachers. "It is generally recognized that a teacher's way of thinking and beliefs drive his or her behaviour and decisions both inside and outside the classroom," writes Nwachukwu (2009). Additionally, he stated that the instructor must be proficient in a variety of teaching techniques and procedures as well as comprehend how students learn (Nwachukwu, & Akusoba, 2009).

Natural sciences included chemistry, which requires comprehending ideas and performing computations. In high school, chemistry was a required subject and one of the topics covered on the national test. Chemistry classes cover topics like composition, structure, characteristics, energy changes, and supplementary material. High school chemistry classes are designed to help students grasp related ideas, principles, concepts, and laws so they may use their knowledge in daily life (Dewi, Wardani, Wijayati, & Sumarni, 2019).

The extent of his understanding of the subject topic, or his level of mastery over it. This is crucial since not understanding or having a poor understanding of basic chemistry ideas may lead one to believe that chemistry is impossible and that learning it is unreachable. A learner-centered approach to education that is influenced by the teacher is highlighted by recent changes in education. The teacher will be better able to address each student's particular learning demands if they have a thorough understanding of each one of them. The amount of time a teacher has spent teaching a subject and their level of PCK in that subject are both related to their teaching experience (Samuel, Okonkwo, & Egolum, 2022).

According to Chee & Tan, (2012), Secondary chemistry classes all over the world use a variety of teaching methods; some may be effective while others may not. Additionally, students' learning capacity and preferences for learning methods and styles vary. The key problem in school science classes has been the

emphasis on teaching through chalk and talk, or passive learning; pupils who get this type of education sit still during class activities and believe that their understanding of chemistry is fixed and that no additional activity is necessary (Byusa, Kampire, & Mwesigye, 2020).

Even though science educators have emphasised the importance of improving conceptual knowledge of scientific ideas and procedures, many teachers continue to forgo the use of teaching methods that are guaranteed to benefit students (Adu-Gyamfi, Ampiah, & Agyei, 2018). Even after being given instructions, many students still leave science lectures with misconceptions, according to Adadan (2014). (Nicoll, Francisco, & Nakhleh, 2001) Learners must invest time and effort in instructional practices that aim to create conceptual transformation. However, the practice of science education has placed a strong emphasis on memorization of numerous scientific principles (Anim-Eduful, & Adu-Gyamfi, 2022).

An allied study by Zusho et al. (2003), which focused on the role of motivation in learning science and more specifically chemistry as a separate science subject, showed that students' beliefs about their own ability and the value of the task they are given are important predictors of how well they perform in chemistry. The same researchers found that when students' assessments of their confidence to perform well in chemistry classes declined over time, so did their perceptions of the value and/or utility of the chemistry course. Furthermore, Salta et al. (2012) give research that indicates that students who lack the enthusiasm to learn chemistry frequently shy away from advanced chemistry programmes and employment in the field (Salta, & Koulougliotis, 2015).

The quality of the chemistry education provided in the school system continues to be largely determined by the chemistry instructor. In accordance with this, Ugwuanyi & Enogu (2013) assert that it is the teacher's responsibility to offer the chemistry curriculum in a suitable and efficient manner. Therefore, it is crucial that the chemistry instructor who will teach the curriculum undergo prior and ongoing preparation (Igboanugo, 2019). It follows that the teaching and learning process for chemistry is influenced by how well-suited the teacher is in terms of knowledge, years of experience, and preparation. According to Olaleye (2011), there is a connection between the teaching style of a teacher and how the material is delivered. According to Gravestock & GregorGreenleaf (2008), the qualifications, experience, gender, attitude, and personality of teachers were determined to be the most prevalent in various country studies (Igboanugo, 2020).

In the study of matter and related fields, chemistry plays a crucial role. This guides a number of initiatives designed to improve secondary school pupils' performance in chemistry. According to Akinfe (2012), one of the science subjects that one must pass in order to be eligible to teach science-related courses at the tertiary level of education is chemistry. Students' performance in chemistry, however, continued to be subpar despite an increase in the number of qualified teachers, their acquisition of further degrees, and their expanding experience in the subject's instruction. The pedagogical content knowledge of chemistry teachers in secondary schools—which comprises knowledge of what to teach, how to teach the subject matter successfully, and knowledge of the content—may be problematic, according to Mushashu (2010) and Sichizya (2014) (Samuel, Okonkwo, & Egolum, 2022).

Learning is actually the interaction of new knowledge with previously held knowledge. The innovative abstract chemistry concepts and the current tangible chemistry knowledge can be connected through the use of effective teaching methodologies. The perfect setting for teaching

and learning in chemistry requires a lot of work from the teachers. Teaching must convey topics in a manner that is both an accurate portrayal of the scientific principles and understandably simple for the students. This necessitates making an effort to identify problem areas in the regional settings of teaching and learning. If problem areas are found, teachers will be inspired to adopt creative approaches in a more efficient and targeted manner to address students' problems there (Gafoor, & Shilna, 2013).

The focus questions for this overview of the literature are:

- To what extent chemistry teachers' mastery level is a cause for difficulties in learning chemistry?
- To what extent chemistry teachers' teaching methods become a cause for difficulties in learning chemistry?

## Null Hypothesis

$H_0$1: There is no significant difference between the perceptions of public and private sector students about teaching methodology as a cause of students' difficulties in learning chemistry.

## Research design and methods

The research was descriptive in nature, and it was carried out using quantitative data collection techniques. The framework and positivistic paradigm is the foundation of quantitative research.

## Population

All public and the private school systems with 10 or more branches in Lahore City comprised of the population.

## Sampling technique and sample size

From the desired population, a sample was chosen in stages. First, the researcher used the stratified sample technique to identify two strata (public/private). There were divisions of strata within each stratum. Seven school systems (sub strata) from the private sector were chosen for sampling. Using the cluster sampling technique, the researcher took six schools (three for girls and three for boys) from each school system. These seven school systems were used to choose the twenty-one male and twenty-one female schools. Eight students were randomly picked from each school. Five tehsils (sub strata) of Lahore were found in the public sector. 10 boys' and 10 girls' schools from each tehsil, together with fifteen pupils from each school, were chosen at random. As a result, 300 individuals from the public sector and 336 from the private sector, a total of 636 participants, were chosen.

**Table 01** Sample size of public and private secondary school students

| | **Public** | | **Private** | | | | | | | | | | | | | | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | D.A | | Unique | | KIPS | | Allied | | Educator | | Smart | | City | | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | |
| Schools | 10 | 10 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 62 |
| Participants | 150 | 150 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 636 |

## Instrument of study

In the study, a questionnaire was employed to collect data. For gathering data, a questionnaire with a five-point Likert scale has been deemed beneficial. Strongly disagree to strongly agree were the scale's options. Expert evaluation and pilot testing were used to determine the validity

of the instrument. Three experts were asked to respond for the questionnaire about the instrument's validity regarding language, structure, relevance, and substance. Cronbach's Alpha was determined to assess the questionnaire's dependability. The reliability threshold for Cronbach's Alpha is 0.75, and its overall value was 0.879. This demonstrates the instrument's reliability.

### Data Analysis

Data were gathered by the researcher using questionnaires. Software from statistical packages for social science (SPSS) was used to examine the data. For all research questions, descriptive statistics (mean, standard deviation, and frequency) were utilized to get the answers.

### Data Analysis at factor Level

First of all, data have been reported with respect to the factor of content as a cause of difficulty in learning chemistry at secondary level.

**Table 02** Content of chemistry as a cause for students' difficulty in learning chemistry (N=636)

| Factors | M | S.D. |
|---|---|---|
| Mastery level | 3.7201 | 1.35169 |
| Teaching techniques | 3.4591 | .99046 |
| Concept illustration | 3.4974 | .95029 |
| Focus of teacher | 3.1638 | 1.01293 |
| Motivation | 3.5723 | 1.04856 |
| Group formation | 3.0550 | 1.07299 |
| Student engagement | 3.6688 | .87804 |
| Student psychology | 3.5928 | 1.17287 |
| Unbiased interaction | 3.5456 | 1.30032 |

The above table illustrates that with respect to nine factors (mastery level, teaching techniques, concept illustration, focus, motivation, group formation, students' engagement, student psychology and unbiased interaction), the mean score (M = 3.40; SD=0.60) of students' perceptions about the teaching methodology was at moderate level. The mean score ranges from M=3.05 (group formation) to M=3.72 (mastery level). The level of participants' perceptions regarding the factors of focus of teacher (M=3.16, SD=1.01) and group formation (M=3.05; SD=1.07) were at moderate level. For the other seven factors; Mastery level (M=3.72, SD=1.35), teaching technique (M=3.45, SD=0.99), concept illustration (M=3.49, SD=.95), motivation (M=3.57, SD=1.04), students' engagement (M=3.66; SD=.87) student psychology (M=3.59, SD=1.17) and unbiased interaction (M=3.54, SD=1.30), the participants' perception level was at the high level.

### Data analysis at items level (teaching methodology)

Analyzing data of students' perceptions about learning chemistry at factors level, data were further analyzed at items level for each of nine factors separately.

### 1- Mastery level

**Table 3** Students' Perceptions about mastery level of teacher of teaching methodology at secondary level (N=636)

| Item | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher has mastery (having full command) over course content. | 80 (12.6) | 55 (8.6) | 49 (7.7) | 231 (36.3) | 221 (34.7) | 3.72 | 1.35 |

This table illustrates how secondary level teaching methodology satisfies a high level of mastery for chemistry teachers (M=3.72, SD=1.35). In other words, according to 71% of the students, their chemistry teacher is an expert in the topic. According to respondents' impressions of the one item that makes up this element, students' perceptions of the mastery level of their teachers' subjects are that they are completely knowledgeable about them.

**2- Teaching techniques**

**Table 4** Students' Perceptions about teaching techniques of teacher of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher uses lecture method to teach the course. | 38 (6.0) | 101 (15.9) | 87 (13.7) | 212 (33.3) | 198 (31.1) | 3.68 | 1.23 |
| Chemistry teacher uses experiment to explain the concept. | 79 (12.4) | 119 (18.7) | 130 (20.4) | 186 (29.2) | 122 (19.2) | 3.24 | 1.29 |

The secondary level teaching methodology described in this table achieves a moderate degree of competence for chemistry teachers (M=3.45; SD=.990). (M=3.68; SD=1.23) were at a high level and 64% agreed that the chemistry teacher employs the lecture technique to teach the subject. 48% of respondents (M=3.24; SD=1.29) who agreed that a chemistry teacher utilizes an experiment to demonstrate a concept were at a moderate level.

**3- Concept illustration**

**Table 5** Students' Perceptions about concept illustration of teacher of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher uses A.V. Aids (modals, charts, pictures or videos) to make understand the concept to students. | 147 (23.1) | 128 (20.1) | 115 (18.1) | 140 (22.0) | 106 (16.7) | 2.89 | 1.41 |
| Chemistry teacher uses examples from daily life to make the concept understood. | 51 (8.0) | 67 (10.5) | 89 (14.0) | 226 (35.5) | 203 (31.9) | 3.73 | 1.23 |
| Chemistry teacher explains clearly the chemical terms during lecture. | 38 (6.0) | 65 (10.2) | 74 (11.6) | 221 (34.7) | 238 (37.4) | 3.87 | 1.19 |

The secondary level concept illustration teaching methodology is described in this table (M=3.49; SD=0.96). 39% of participants agreed with the assertions that a chemistry teacher uses A.V. aids (modals, charts, photos, or videos) to help pupils understand the subject (M=2.89; SD=1.41) at a moderate level. 72% agreed that the Chemistry instructor clearly explains the chemical concepts during lecture (M=3.87; SD=1.19), and 67% agreed that the Chemistry teacher uses examples from everyday life to make the idea understandable (M=3.73; SD=1.23). Overall, student views continued to be highly congruent.

**4- Focus of teacher**

**Table 6** Students' Perceptions about focus of teacher of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher focuses on content reading while teaching. | 125 (19.7) | 200 (31.4) | 98 (15.4) | 136 (21.4) | 77 (12.1) | 3.44 | 1.31 |
| Chemistry teacher focuses on rote learning. | 181 (28.5) | 171 (26.9) | 136 (21.4) | 93 (14.6) | 55 (8.6) | 2.88 | 1.27 |

This table outlines the secondary level teaching style that satisfies pupils' moderate level focus (M=3.16; SD=1.01). Participants' agreement that the chemistry instructor emphasizes content reading while teaching (M=3.44; SD=1.31) and that the teacher emphasizes rote learning (M=2.88; SD=1.27) was at a moderate level (34%; M=2.88; SD=1.27). The general opinion of students remained unclear.

**5- Motivation**

**Table 7** Students' Perceptions about motivation of students of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher motivates the students for learning. | 49 (7.7) | 69 (10.8) | 96 (15.1) | 258 (40.6) | 164 (25.8) | 3.66 | 1.19 |
| Chemistry teacher creates interest by telling practical application. | 69 (10.8) | 86 (13.5) | 123 (19.3) | 183 (28.8) | 175 (27.5) | 3.49 | 1.31 |

This table demonstrates how the secondary level teaching style satisfies the high degree of student motivation (M=3.57; SD=1.04). Participants were divided on whether chemistry teachers inspire students to learn (M=3.66; SD=1.19) and if they pique students' attention with high-level explanations of practical applications (M=3.49; SD=1.31). The general opinion of students remained quite positive (agreed to the statement).

**6- Group formation**

**Table 8** Students' Perceptions about group formation of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Chemistry teacher makes groups according to students' abilities. | 103 (16.2) | 145 (22.8) | 118 (18.6) | 177 (27.8) | 93 (14.6) | 3.02 | 3.09 |
| Chemistry teacher gives practice work in the form of students' groups. | 82 (12.9) | 167 (26.3) | 122 (19.2) | 141 (22.2) | 124 (19.5) | 3.09 | 1.33 |

The teaching technique at the secondary level satisfies group formation at a moderate level, according to this table (M=3.05; SD=1.07), which also demonstrates that students' perceptions of the teaching methodology regarding group formation were at a moderate level (undecided). 42% of respondents agreed that the chemistry teacher assigns practice work in the form of student groups (M=3.09; SD=1.33) and creates groups based on the students' skills (M=3.02; SD=3.09; intermediate level). The general opinion of students was kept at a modest level (undecided).

### 7- Student engagement

**Table 9** Students' Perceptions about student engagement of teaching methodology at secondary level (N=636)

| Items | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher permits the class discussion with teacher. | 47 (7.4) | 73 (11.5) | 127 (20.0) | 247 (38.8) | 142 (22.3) | 3.57 | 1.16 |
| Chemistry teacher asks students questions to involve them in the lesson. | 36 (5.7) | 56 (8.8) | 98 (15.4) | 212 (33.3) | 234 (36.8) | 3.87 | 1.17 |
| Chemistry teachers' teaching style is interactive (two-way communication / involving). | 55 (8.6) | 77 (12.1) | 119 (18.7) | 223 (35.1) | 162 (25.5) | 3.57 | 1.23 |

The secondary level teaching methodology examined in this table (M=3.66; SD=0.87) aims to maximize student engagement. According to the students' responses, 70% of them agreed that the chemistry teacher asks them questions to get them involved in the lesson (M=3.87; SD=1.17), 61% agreed that the chemistry teacher's teaching style is interactive (two-way communication / involving), (M=3.57; SD=1.23), were at a high level of agreement. Participants' perceptions as a whole continued to be positive (agreed).

### 8- Student psychology

**Table 10** Students' Perceptions about student psychology of teaching methodology at secondary level (N=636)

| Item | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher's teaching style is according to students' mental level. | 37 (5.8) | 91 (14.3) | 124 (19.5) | 226 (35.5) | 158 (24.8) | 3.59 | 1.17 |

This table examines secondary level teaching methodologies and covers students' high-level psychology (M=3.59; SD=1.17). Only one, student psychology-related factor—teaching chemistry in accordance with students' mental abilities—was rated favorably by 60% of respondents (M=3.59; SD=1.17). The pupils' overall net perception was kept at a high level.

### 9- Unbiased interaction

**Table 11** Students' Perceptions about unbiased interaction of teaching methodology at secondary level (N=636)

| Item | SD (%age) | D (%age) | U (%age) | A (%age) | SA (%age) | M | S.D. |
|---|---|---|---|---|---|---|---|
| Chemistry teacher behaves equally to each student in the class. | 68 (10.7) | 76 (11.9) | 111 (17.5) | 203 (31.9) | 178 (28.0) | 3.55 | 1.30 |

This table shows that the secondary level teaching style achieves high level, unbiased interaction (M=3.55; SD=1.30). 60% of the students who responded agreed that the chemistry teacher treats every student in the class equally (M=3.55; SD=1.30) were performing at a high level. The general opinion of students was kept at a high level.

**Null hypothesis: There is no significant difference between the perceptions of public and private sector students about teaching methodology as a cause of students' difficulties in learning chemistry.**

**Table 12** Difference between Public and Private Sector Students' Perceptions

| **Factor** | **School Sector** | **N** | **Mean** | **Std. Deviation** | **t-value (df = 634)** | **p (∝ = 0.05)** |
|---|---|---|---|---|---|---|
| Teaching Method as cause | Public | 300 | 3.3290 | .60590 | -3.015 | 0.003 |
| | Private | 336 | 3.4729 | .59643 | | |

The table shows that there were significant differences between the groups at the alpha level of 0.05 for the teaching methodology as a cause of learning difficulty. In comparison to public school students (M = 3.32, S.D. = 0.60), private school students (M = 3.47, S.D. = 0.59) showed a higher level of agreement about teaching approach as the root of students' difficulty studying chemistry. It is concluded from the independent sampling t test that there was a significant difference between students from public and private schools with regard to the teaching methodology as a cause of difficulty in learning chemistry at the secondary level (t (634) = -3.01, p = 0.003, at alpha level 0.05). The overall evidence from this research ultimately rejected the null hypothesis.

**Factor wise difference between public and private sector students' perceptions**

**Table 13** Difference between Public and Private Sector Students' Perceptions

| | School Sector | N | Mean | Std. Deviation | **t-value (df = 634)** | **P (∝ = 0.05)** |
|---|---|---|---|---|---|---|
| Mastery level | Public | 300 | 3.3533 | 1.46137 | -6.685 | 0.000 |
| | Private | 336 | 4.0476 | 1.15285 | | |
| teaching techniques | Public | 300 | 3.4100 | .99425 | -1.182 | 0.238 |
| | Private | 336 | 3.5030 | .98647 | | |
| Concept Illustration | Public | 300 | 3.4744 | .98242 | -.575 | 0.566 |
| | Private | 336 | 3.5179 | .92165 | | |
| focus of teacher | Public | 300 | 2.6200 | 1.01770 | 2.033 | 0.042 |
| | Private | 336 | 2.4568 | 1.00391 | | |
| motivation | Public | 300 | 3.5467 | 1.03508 | -.583 | 0.560 |
| | Private | 336 | 3.5952 | 1.06147 | | |
| group formation | Public | 300 | 3.2017 | 1.00592 | 3.282 | 0.001 |
| | Private | 336 | 2.9241 | 1.11478 | | |
| student engagement | Public | 300 | 3.4944 | .89362 | -4.813 | 0.000 |
| | Private | 336 | 3.8244 | .83493 | | |
| student psychology | Public | 300 | 3.3800 | 1.14308 | -4.384 | 0.000 |
| | Private | 336 | 3.7827 | 1.16816 | | |
| unbiased interaction | Public | 300 | 3.4800 | 1.25759 | 0.363 | 0.230 |
| | Private | 336 | 3.6042 | 1.33646 | | |

The table discloses that the groups differed significantly for the teaching methodology sub-factors as cause of difficulty in learning, where the difference was significant at alpha level 0.05. Private school students (M = 4.04, S.D. = 1.15) reflected higher level of agreement about mastery level than that of public-school students (M = 3.35, S.D. = 1.46), and describes a significant difference exist regarding the mastery level as cause of students' difficulties in learning chemistry between public and private sector (t (634) = -6.68, p = 0.000). Public school students (M = 2.62, S.D. = 1.01) reflected higher level of agreement about focus of teacher as a cause of

students' difficulties in learning chemistry than that of private-school students (M = 2.45, S.D. = 1.00) and illustrate a significant difference in focus of teacher as cause of students' learning difficulties in chemistry (t (634) = 2.033, p = 0.042). Public school students (M = 3.20, S.D. = 1.00) reflected higher level of agreement about group formation as a cause of students' difficulties in learning chemistry than that of private-school students (M = 2.92, S.D. = 1.11), which shows a significant difference with respect to group formation as cause of learning difficulties in chemistry students (t (634) = 3.282, p = 0.001). Private school students (M = 3.82, S.D. = 0.83) reflected higher level of agreement about students' engagement as a cause of students' difficulties in learning chemistry than that of public-school students (M = 3.49, S.D. = 0.89), the t (634) = -4.81, p = 0.000 values demonstrates the difference of students' engagement as cause of chemistry students learning difficulties between private and public school level, and Private school students (M = 3.78, S.D. = 1.16) reflected higher level of agreement about student psychology as a cause of students' difficulties in learning chemistry than that of public-school students (M = 3.38, S.D. = 1.14), which means a significant difference exist regarding student psychology as cause of secondary students' difficulties in learning chemistry (t (634) = -4.81, p = 0.000). In all cases the alpha level of significance was 0.05. So, there was a significant difference between public and private schools' students with respect to the teaching methodology sub factors (mastery level, focus of teacher, group formation, students' engagement, student psychology) as a cause of difficulty in learning chemistry at secondary level. Hence, the data of this study didn't support the null hypothesis.

While on the other hand, the strata did not significantly different for the sub-factors of teaching techniques (t (634) = -1.182), concept illustration (t (634) = -.575, p = 0.566), motivation (t (634) = -.583, p = 0.560) and unbiased interaction (t (634) = 0.363, p = 0.230), where the difference was not significant at alpha level 0.05. There was no statistically significant difference between public and private schools' students with respect to the sub factors (teaching techniques, concept illustration, motivation and unbiased interaction) as a cause of difficulty in learning chemistry at secondary level. So null hypothesis regarding these sub-factors was accepted.

## Discussion and conclusion

The opinions of the students regarding the chemistry teachers' methods of instruction were moderate. Low performance in chemistry is a result of inefficient teaching methods and teaching aids, as well as a negative attitude toward studying and teaching chemistry (Cheung, 2011). The latter was supported by Cheung (2009a), who conducted the study in Hong Kong, and the students interviewed stated that they do not like chemistry because of the conventional teaching methods based on chalk and talk frequently used by the teachers as they solve straightforward problems on the boards. They claimed that their lecturers mainly prepared them for public exams, where they were given stuff to remember. They are only given a few opportunities to carry out laboratory experiments.

Since most teachers in chemistry classes use rote learning, students become bored and begin to have a bad attitude about the topic. This is corroborated by Morabe (2004), who identified a number of causes, including teachers' incapacity to carry out high-quality practical exercises, a lack of understanding of scientific concepts, and students' perceptions of science—including chemistry—as being difficult. Students therefore require greater help in order to foster positive attitudes toward chemistry-related topics (Musengimana, Kampire, & Ntawiha, 2021).

Despite the fact that there have always been students with varying levels of success, one of the main difficulties for teachers in mixed-ability classrooms is to take into account the needs of all pupils (Gayeta, 2019). Teachers should be able to modify and develop their lesson plans in accordance with the needs of their pupils, but many lack the knowledge and training necessary to consider the needs of all students (Markic, & Abels, 2014; Benny, & Blonder, 2018). Additionally, there is a lack of effective teaching tools and techniques. However, by providing teachers with well-structured training that increases their knowledge and abilities, the achievement in mixed-ability classrooms can be increased (Kousa, Kavonius, & Aksela, 2018).

The secondary students' perceptions about nine factors (mastery level, teaching techniques, concept illustration, focus, motivation, group formation, students' engagement, student psychology and unbiased interaction), the mean score (M = 3.40; SD=0.61) of students' perceptions about the teaching methodology was at moderate level. Even though the teachers may not be knowledgeable about cognitive problems, we can simply observe how well exercise and alignment (Lopes & Crenitte, 2013). The key to teaching someone who has severe learning challenges is to micromanage their learning process over an extended period of time. The more the grade that we must manage the learning process at the micro level in order to be significantly effective, the lower the level of low-level learning abilities, lack of cooperation, and lack of drive. Greater the level of diminished learning capacities, the more clearly, we must teach him/her everything we want them to know (Smith & McDonald, 2013).

### Mastery level

The mean score (M=3.72) for the factor (mastery level) indicates that students' perceptions of teachers' mastery levels were at a high level (agreed). This statement was intended to convey to the pupils that their chemistry teacher is an expert in all thing's chemistry-related and that they can trust him to teach them the subject matter completely.

### Teaching techniques

The level of student perceptions of teaching methods and approaches was high. Participants claim that the chemistry instructor uses lectures to teach the subject matter of chemistry; however, they are unsure whether the teacher employs experiments to clarify concepts. The experiments cannot be used by the teacher to help the pupils grasp the idea. The teacher primarily concentrates on getting the subject finished on time rather than helping the pupils grasp the concept through instructional methods.

### Concept Illustration

The concept illustration of the teaching methodology was well received by the students. Students thought that the chemistry teacher used real-world examples to help them understand the idea. Additionally, they thought that the lecturer did a good job of explaining the chemical words so that they could understand the lecture's chemistry topic. Most students may not be aware of A.V. Aids and may be unsure whether or not to use them in lectures because teachers rarely use them to aid in comprehension.

### Focus of teacher

Students' perceptions of the teacher's focus on the teaching methodology are moderately positive (undecided). This is because teachers tend to focus more on content reading than on actually teaching. They emphasize memorization of the material without a thorough understanding of the subject, however the students claimed that this is not their main focus. Because of how teachers' influences on their students, this may have presented a false impression.

### Motivation

Students had a very positive view of the teacher's motivation in their instruction. The internal process known as motivation gives a person the

drive to focus their efforts on meeting a need (Chans, & Portuguez Castro, 2021). The participants believed that their teachers inspired them to learn, however it's conceivable that they were referring to learning concepts through application rather than rote memorization. Regardless, they were in agreement that practical work should be used to teach chemistry.

### Group formation

Most respondents had moderately positive impressions of the use of groups in teaching methodology (undecided). Since teachers don't divide students into groups based on ability, the decision to divide students into groups for learning was left up to the students. The students were unsure (nearing the disagree level) about that group formation for better learning of chemistry since the chemistry teacher rarely delivers practice work in the form of students' groups for learning.

### Student engagement

Participants had very positive evaluations of how students responded to educational strategies (agreed). The chemistry teacher allows for class discussion with the teacher to help students understand, but it's possible that the teacher uses class discussion to clarify the meaning of specific words from the chemistry text book rather than to provide a comprehensive explanation of the terms used in the chemistry content. Students believe that the teacher involving them in lecture helps them learn the chemistry material more effectively because the chemistry teacher asks them questions to engage them in the lesson and the chemistry teacher's teaching style is interactive (two-way communication / involving) for students. In a variety of situations, paying attention to what the students are learning instead of what the teacher is putting into the lesson has enhanced both student interest and achievement (Wiliam, 2013).

### Student psychology

Students had positive evaluations of how instructional methods used student psychology (agreed). The participating pupils believed that their chemistry teacher taught according to the mental capacity of her students. This is due to the fact that teachers may clarify phrases that students find difficult to understand or they may simply explain the meaning of English words that students frequently find uncertain while the teachers just concentrate on content reading.

### Unbiased interaction

Students had a positive opinion of the factor of equity in teaching methodology (agreed). Each student in the class receives the response from the chemistry teacher in an impartial manner. It's likely that students misled the researcher as a result of the teacher's influence and control over them.

The majority of secondary students gave highly positive feedback about their chemistry teachers' teaching approaches, it was determined in the end. The respondents believed that their chemistry teachers had a firm grasp on the subject, indicating a very high degree of competence. They also concurred that their teacher should concentrate on helping the class comprehend and learn chemistry. Students felt that their teacher engaged them and encouraged them to learn chemistry, which led to better comprehension and learning. Additionally, respondents believed that their teachers' teaching strategies were tailored to each student's cognitive ability and that they treated all students equally for concept learning and understanding in the classroom. The participants are still unclear as to whether or not their chemistry professors' methods of instruction aid in the study of chemistry. They also exhibit a fair amount of agreement with the concept illustrations provided by the chemistry teachers, but they are split on the idea that their teachers should create groups to help the students comprehend and study the subject matter.

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