Original Research Article

Bhutanese Students' Anxiety in Learning Chemistry and its Impact on Chemistry Performance in Higher Secondary Schools

Comment [AM1]: The impact of anxiety on learning chemistry: The case of Bhutanese Higher secondary school students

Abstract:

The study was designed to find out the cause of students' anxiety towards learning chemistry at higher secondary school in Samtse district. The relationship between anxiety level and performances in chemistry among students was investigated. Data for the study was obtained by administering Anxiety Questionnaire for students (AQS) to respondents involved in the study. In addition, semi-structured interview was carried out for data triangulation. The data obtained was analyzed using SPSS version 22 and thematic coding.

Comment [AM2]: To explore the impact or the cause?

The result indicated that the major cause of anxiety in chemistry subject was syllabus anxiety. The finding revealed that students including high, average and low performers of semi-urban school have more anxiety as compared to students of urban school at Samtse district. In other words, students studying in semi-urban location has more anxiety than the students located in urban schools. The study also examined the relationship between anxiety and chemistry performances of the students in grade 12. It was confirmed that a significant negative relationship (r=-.465**, n=114, p=0.001) exist between anxiety and performances of the students in chemistry subject. High anxiety results in low chemistry performances and vice versa.

Comment [AM3]: Too poor language to express ideas, and no recommendation for the stakeholders did not address so that one who read only the abstract part might not grasp the overall idea.

Keywords: Anxiety, learning chemistry, academic achievement, physiological and syllabus

Introduction

Anxiety in this research paper means students' feelings, timidity, nervousness, worry, fear for the lesson, shivering and difficulty while responding to the teacher during chemistry lessons. The academic achievement of the students in chemistry is determined by the level of the anxiety students possess (Eddy, 2000, p.514). In Bhutan, the achievement of students in chemistry has been consistently low over the past few years (BCSEA, 2013, 2014, 2015, 2017, 2018, 2022). Moreover, huge curriculum reforms are implemented focused on improving the school's educational outcomes. The recent one includes National School Curriculum (NSC) published by Royal Education Council (REC). The comparative analysis of the chemistry performances with national mean mark and mean mark of Samtse district shows the following data, as shown in table 1 (Only for Chemistry)

Comment [AM4]: Do you think that the reason behind is just rest on only on the issue of anxiety

Table 0

	2012	*2013*	*2014*	*2016*	*2017*	*2021*	*2022*
National Mean Mark	61.04	57.92	57.77	49.69	56.04	66.90	68.09
Samtse District mean mark	58.37	52.68	57.34	48.16	50.51	59.21	62.01

Difference in Mean Mark Between National and Samtse District for Chemistry Subject

The data represented in table 1 shows that the performance of chemistry subject in Samtse district has been consistently low in comparison to the national mean mark.

As a chemistry teacher and researcher, it was observed that students fear for learning chemistry and students hardily open-up to interact with teachers in the class. Students would rather get anxious. During the lesson, students would choose to remain silent and refrain from asking questions or clarifying doubts even if they don't understand certain topics.

Purpose

Numerous studies have shown that performances of students depend on many factors. Teacher factor as explained by Haider & Hussain (2014) which determines students' performances and interest towards the subject. The learners are losing interest in chemistry subject because of the lack of interest, attitude and syllabus which burdens them (Yunus & Ali, 2012). Students achievement is determined by other factors such as school factors and classroom practices. School factor may include physical ambience, better structure and safe environment (Oginni, Awobodu, Alaka, & Saibu, 2013) whereas Classroom practices includes positive learning atmosphere, use of better teaching strategies and enforcements (Wenglinsky, 2001).

In the study conducted by Shakir (2014 p.34) it was found out that anxieties developed by students' in learning chemistry is a major factor affecting learning as well as performances. Data reveals that when students suffers from the high level of anxiety their performances declines and vice versa (Vitasari, Wahab, Othman, Herawan, & Sinnadurai, 2010). Therefore, this study will explore and examine Bhutanese students' anxiety in chemistry and its impact on performance at higher secondary schools. In particular, this research will inspect different causes leading to students' anxiety in learning chemistry. This study is carried out at Samtse district located at the southern belt of Bhutan focused to high school students taking chemistry subject in grade 12. The data will be collected from urban and semi-urban schools to analyses the difference in the anxiety faced by students. In addition, comparative study will reveal degree of anxiety faced by the high achievers and low achievers respectively.

Significance

Comment [AM5]: Better to put it after research question

This research study is first of its kind, which will be carried out in Bhutan. No research has been done related to the anxiety in learning chemistry with students at higher secondary school till date. The study will open avenues for future researchers to explore more about the anxiety of the students and causes in many other disciplines. It will, thus, lead to a further inquiry into the important but often neglected areas in education about anxiety. The research findings will assist in making informed decisions about how anxiety in learning chemistry can influence the students' performances and explore possible causes of anxiety. Moreover, how improvement over teaching methods, the behavior of teacher, syllabus, and self-confidence can reduce anxiety in learning chemistry. Thus, the study will be useful for the overall improvement in the quality of chemistry education in the country.

The findings of this study will prove valuable to educational leaders, school principals, and teacher educators in Bhutan, as they will provide insights on positive perceptions and

consideration for anxiety on students and help teachers better understand physiological, emotional and non-cognitive causes that hinder the academic achievement of students in chemistry. The findings of this research should enable these educators as well as teachers to understand and value the impact of the anxiety in identifying significant barriers to student learning and explore various means to reduce anxiety.

This research study is also expected to address gaps by exploring the extent of relationships between the anxiety and achievement in chemistry across two secondary schools in Samtse district. Thus, the study will add to the theoretical knowledge by examining the causes of anxiety in chemistry subject and apprise about the needs for change in educational policy.

Scope and Limitation

The research is carried out at Samtse district with the higher secondary students. The sample size and the population taken into consideration may not absolutely translate the finding to the larger population. Besides, the study is focused on grade 12 students, in order to explore the anxiety of students in learning chemistry. Moreover, data were collected and analyzed based on higher secondary schools in and around Samtse district. Students learning chemistry in middle secondary schools were not considered for the study.

Research Question

What are the causes of anxiety in learning chemistry and how it impacts performances in chemistry education?

Research Sub-question

1. What are the different causes that lead to anxiety in learning chemistry in schools?
2. What is the degree of anxiety between high achievers and low achievers, students possess in semi-urban and urban schools?
3. How anxieties of the students in chemistry influences the chemistry performances of the students?

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Literature Review

Definition

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Turner and Lindsay (2003) define chemistry anxiety as related to a "student's feelings towards chemistry, such as timidity and nervousness, worry, shortness of breath, tension, stress, and bodily display of these emotions" (p.563). Similarly, McCarthy and Widanski (2009) not only described anxiety as fear for learning and handling chemicals but also fear of evaluation. In the research carried out by Eddy (2000), chemistry anxiety exists among students across many developed countries, including the United States. Due the fear for chemicals and fear for chemistry as a course, it has resulted to decline in the number of enrolments in chemistry classes. Students have the negative impression about learning chemistry subject in the class which is predetermined. Their negative attitude largely

disproves their interest, readiness, and excitement for the chemistry course (McCarthy & Widanski, 2009).

According to Jegede (2007), there are various causes of the anxiety namely syllabus coverage on the required time frame, employment prospects, teacher's interest and motivation, teaching methodology and use of chemistry laboratory. The qualitative content analysis by Kaya and Yildrim (2014) has produced five major sources of science anxiety: "unpleasant classroom activities," "fear of test," "perceptions of chemistry," "teacher attitude," and "parent attitude". Numerous authors have suggested that low achievement is linked to both high levels of anxiety and poor learning outcomes in school. Organic chemistry anxiety also appears to be a negative psychological construct because organic chemistry anxiety in students manifests as an inability to think clearly, a fear of failure, negative self-evaluation, and self-blame (Anand, Sharma, & Khatoon, 2013; Morris; Olatoye, 2009).

It was also studied that teacher's attitude can have various effects on anxiety and performances of the students as the anxiety is caused by the teachers' attitude in an educational setting. According to Stomff (2014) Students tends to build prerequisite believe that discipline is difficult and they construct a negative mindset, a teacher in the other hand can play a vital role in molding students. In addition, teachers threatening attitude, practice of teaching in rude manner and their non-friendly or strict behavior in the class can accelerate frustration and apprehension. The anxiety gets intensified when the teacher gives students the feeling of being backward or unsuccessful. The results were concordant to the finding carried out by (Abbasi, Samadzadeh, & Shahbazzadegan, 2013).

The several findings of the research showed that providing opportunities for cooperative, moderate and competitive learning at schools can reduce the students' anxiety (Kaya & Yildrim, 2014; Muttaqin, 2015). Findings indicated that teaching methods largely impacts students' level of anxiety. The usage of conventional teaching method which is common in high school assures teachers syllabus coverage but creates minimum learning impacts (p.35).

Chemistry is a science based on experimentation thus, students require inquisitiveness. Without practical learning, theoretical aspect is not enough for students to understand the lessons clearly. A negative relationship was found between pre-service-teachers' chemistry laboratory anxiety levels and their achievement in the chemistry laboratory. The results of this study also show that students having high anxiety about "having adequate time" and "using equipment and chemicals" in the laboratory had low achievement in chemistry laboratory (Kaya & Cetin, 2012).

Anxiety and Academic Performances

Anxiety is one factor which affects students' performances in chemistry (Kurbanoğlu, 2013). The study conducted by Kurbanoğlu (2013) revealed that university students with high organic chemistry anxiety had significantly lower academic achievements. This shows that there is a significant negative relationship between organic chemistry anxiety and the achievement of students studying organic chemistry (p.130). Researchers suggested that low achievement in chemistry is frequently determined by chemistry anxiety (Jegede, 2007).

The study has been carried out to investigate the relationship between anxiety level and the academic achievement of the students. It was found out that, there was a correlation between

anxiety levels and academic achievement. Students with high anxiety had negative impact in their academic performances. likewise, comparatively girls encountered high anxiety as compared to boys. (Syokwaa, Aloka, & Ndunge, 2014). Hembree (1988) carried out research to examine the relation between test anxiety and academic performances. The finding revealed that test anxiety is a significant factor in damaging student performance. In addition, Students with high levels of test anxiety score significantly lower marks on standardized tests in mathematics and literature disciplines (p.47). Similarly, a study on test anxiety by Asghari, Kadir, Elias, and Baba (2012) found that test anxiety also significantly affects academic success.

Research Design

Mixed method was used in this study in order to analyse the data. Since it provides empirical evidences for the finding and interpretation (McKim, 2017). Data collection was done through the survey questionnaire and interview with teachers and students.

Moreover, the data collected was triangulated in order to determine convergence across qualitative and quantitative methods (Creswell, 2014). Out of three concurrent mixed methods design strategies, concurrent triangulation was used taking into account its shorter data collection time (Creswell, 2009).

Population and Sample

Table 2

To Illustrate a Number of Students in Samtse Dzongkhag Within Two School

Sl. No	Name of the school	Grade XII		Total
		Section A	Section B	
1.	Urban School	24	23	47
2.	Semi-urban School	33	34	67
			Total	114

The sample population was approximately 114 students and one teacher each from two schools was selected for interview. The sample size was determined using the Sample Size Calculator. The Sample Size Calculator is presented as a public service of *Creative Research Systems survey* software. It can be used to determine how many people are needed in order to get results that reflect the target population as precisely as needed. Level of precision can also be found out in an existing sample. The confidence level was kept at 95 percent with a confidence interval of 5 with a population of 114. It was found out that the minimum sample size needed is 92 for the study. Therefore, all the students from grade 12 were selected for the AQS questionnaire which includes 114 students.

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Probability sampling was carried out from which stratified random sampling method was administrated for the questionnaire. Non-probability sampling was selected for an interview. Non-probability sampling is a sampling technique where the samples are gathered in a process that does not give all the individuals in the population equal chances of being selected (Vehovar, Toepoel, & Steinmetz, 2016).

Students were categorized as high performer, average performer and low performer. The categorization of the students was confidential and they were chosen based on their marks obtained in Mid-term examination. Therefore, total of two chemistry teachers and six students were selected from each school for interview.

Instruments

A survey questionnaire which is the quantitative method was used to collect data for this study with closed-ended questions. Participants were asked to complete a survey questionnaire known as Anxiety Questionnaire for Students (AQS), consisting of a series of questions taken from the Chemistry Anxiety Scale developed by Jegede (2007). In addition, the questionnaire was also adapted Abendroth and Friedman (1983) and Persian version of Foreign Language Classroom Anxiety Scale questionnaire (FLCAS) based on a five-point Likert scale (ranging from completely agree to completely disagree) adapted from Amiri and Ghonsooly (2015).

Interview provides researcher to explore perspectives on a particular idea, program or situation (Alshenqeeti, 2014) and provides an in-depth study of the particular phenomenon (Jamshed, 2014). The data was analysed using SPSS version 22. However, interview was analyzed using thematic coding.

Ethical Consideration

Ethics are of great concern in research while dealing human subject. Proper legal permission must be taken to minimize or eliminate any form of legal action. Therefore, permission for the data collection were approved by various sector heads to carry out research. In addition, concern letter was collected from each participant in the study. The names of the participants are well-taken care and kept confidential.

Results

Cross-tabulation of the data indicated that students have fear/worry/tension in learning chemistry. 79.46 % of the students accepted the opinion that chemistry leads to anxiety. Whereas, 20.5% of the total students believed that they don't have worry or fear of learning chemistry.

Anxiety Questionnaire for students (AQS) was developed based on the following themes as represented in the graph, which resulted in anxiety in chemistry subject. The themes generated from the quantitative data are namely syllabus anxiety, teaching methods and strategies, laboratory and practical, examination and test anxiety, teacher's behavior, and classroom anxiety

Figure 1

Comparison of the Mean Rating of the Cause of Anxiety

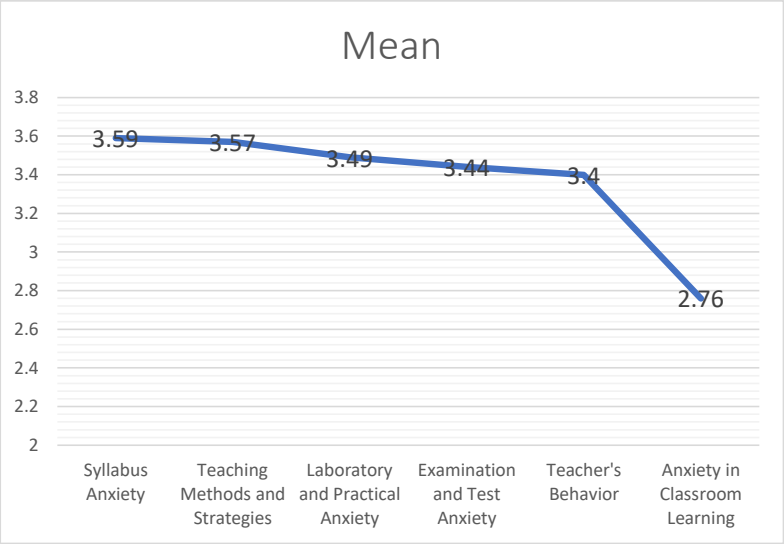

Figure 1 provides a description of the different causes that leads to anxiety in chemistry subject. It was clearly indicated that syllabus anxiety is the major cause of anxiety with a mean rating of 3.59 and SD=1.10. secondly, teaching methods and strategies causes anxiety to the greater extend, followed by laboratory and practical anxiety. On the contrary, students have a moderate feeling of anxiety on teacher's behaviour and anxiety in classroom learning. In addition, Teaching Methods and Strategies (x=3.57, SD=1.24), laboratory and practical anxiety (x=3.49, SD=1.23) and Examination and test anxiety (x=3.44, SD=1.18) causes intermediate anxiety in learning chemistry.

Revision Anxiety

Students mentioned about the revision anxiety which students faced in chemistry. Students shared their revision anxiety as mentioned below:

> "I usually do not finish the revision on chemistry lesson easily because the book is very bulky and I get exhausted selecting what to study" (S_1). Students face difficulties to revise on a day-to-day basis considering school activities and assignments (S_2). Timely preparedness is necessary. it is really impossible to revise in the last minutes (S_3). Similarly, S_1 claimed that it is difficult to finish revising chemistry lesson. Students believe that the textbook is bulky, and difficult to revise all the content at the end of the year (S_4). "It doesn't seem possible to finish revising chemistry in time and that makes me worried" (S_7).

Degree of Anxiety Between High Achievers and Low Achievers

The data analysis on degree of anxiety between high, low achiever and average performer from urban and semi-urban school.

Figure 2

Anxiety with High, Average and Low Achiever

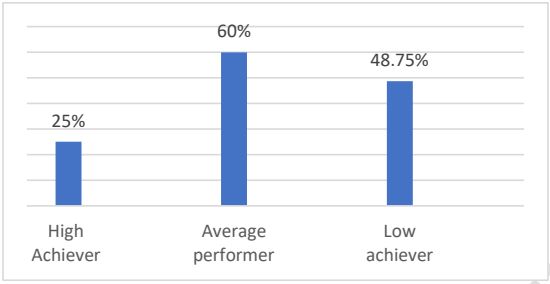

Figure 2 indicates that, out of 12 participants, only 25% anxiety is experienced by high achiever and 48.75% anxiety is experienced by low achiever. Average performer experience 60% anxiety. Thus, it is very clear that average performers are most anxious students. Table 1.2 shows that low achievers are more anxious as compared to high performers.

T_2 responded that students who achieve low marks are more vulnerable to anxiety as compared to those who score high marks. High scorers are more confident and their confidence helps them in overcoming any sorts of challenges.

Relation Between Anxiety and Performances

The performances of the students in chemistry subject depend on the degree of anxiety students possess. Both the teachers agreed that inverse relationship exists between anxiety and performances. T_1 responded that

> "If there is more fear in students, the learning becomes futile because he or she would be totally engrossed in her or his fear, which in turn affects the performance. If the degree of anxiety is less, students will be able to perform better".

T_2 supported that

> "Anxiety is the greatest factor in impacting the performance of students in chemistry subject. Because of anxiety, students tend to forget what they have studied. Anxiety in students about the subject is inversely proportional to their performance, higher the level of anxiety, lower the performance and vice versa. Even some average or good students become so anxious that they give up at the last moment and refuse to sit for the examination."

T_1 supported that "more anxiety means low performances", T_1 added that "teachers can play vital role in shaping and molding the negative mindset of the students. Counseling or planned remedial classes would address underperforming students. Taking such strategies would surely ease students' anxiety. S_5 explained how anxiety has negative impact in their academic performances. students can concentrate on studies only if we don't have worry for the subject. However, the apprehension for the subject results to poor performances. students admit that they even forget the previous lesson caused by anxiety. During examination,

Comment [AM13]: Too simple to measure anxiety

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students tends to forget, what they have learned as soon as they enter the exam hall. Students gets anxious. Thus, academic performances never improve (S_9)

Discussion and Conclusion

Causes of Anxiety in Learning Chemistry

The data findings from this study indicated that the major cause of anxiety in chemistry subject is due to the thickness of the textbook and the presence of irrelevant topics in the textbook with a mean rating of 3.59. Students feel that they have to study concepts which do not have any meaning in their real life. Chemistry syllabus is too wide and irrelevant topics makes textbook bulky. Students would choose to study in-depth on particular sub-topics rather than having all topics included and just studying at a superficial level. Students mostly feel that due to the thickness of the textbook, they might fail the course. The size of the textbook installs fears in students. Vast syllabus leads to the urgency in completing the syllabus on time which compromises students' opportunity to ask doubts. Students also feel anxious thinking the teacher won't be able to complete syllabus on time. This result concurs with those, who found evidence of anxiety due to the notion that the chemistry subject is too wide, demanding and rather bulky (Jegede, 2007; Yunus & Ali, 2012). The finding is consistent with the finding of researcher McCarthy and Widanski (2009).

The way the teacher teaches can determine abstractness of the subject. Different students have different learning abilities therefore, teaching pace in chemistry subject matters. How fast or slow teacher speaks while teaching can determine students' learning and anxiety. Students choose to have an interactive class and share views on chemistry topics. Teachers prefer to use teaching strategies such as flipped classroom, group activities, and co-operative learning because these methods would help reduce students' anxiety. The practice of using video lesson is helpful as it helps to retain students' attention for a longer period of time. Students choose students-centered learning over lecture method as it keeps students engaged and attentive during a chemistry lesson. Students believed that students' anxiety for learning chemistry was majorly caused by the method of teaching. In his study, it was found that co-operative learning teaching strategy helped to reduce anxiety. A teacher needs to use instructional strategies that are suitable for the cognitive abilities of the students and the progression of the subject content should be gradual (Mutawah, 2015). Similarly, students get bored with the lecture, students must be engaged in the lesson. Making students participate in the lesson might help students feel more confident (Kaya & Yildrim, 2014). Similarly, students don't show positive attitude when they are asked to listen to what the teacher is teaching in front such as theories and principles in chemistry (Yunus & Ali, 2012).

The laboratory and practical work carried out in chemistry class expose students to anxiety. The finding also indicates that students generate anxiety mostly because they have to handle chemicals which are corrosive in nature, poisonous and might sometimes cause an allergic reaction when those chemicals come in contact with skin. Fear of mishandling and breaking laboratory equipment cause worry and apprehension doing chemistry practical. Students don't worry much about visiting the laboratory and doing practical, but handing chemicals and equipment generates anxiety in students. For instance, heating test-tube during the experiment and not getting the desired result for salt analysis stimulates fear in students. The study conducted by Kaya and Cetin (2012) stated that students have laboratory anxiety which had a negative relationship with the academic performances

Students feel anxious about examination and test. They strongly believe that they find themselves lost and worried. Whenever there is a change in question format or if students cannot recognize the answer instantly, they panick. Students feel intense pressure on themselves and fear whether they can uphold the expectation of a chemistry teacher, which makes students worried. This study also found that students don't have confidence, and high self-esteem. Students mostly fear that they will not get good grades in chemistry which makes them anxious. Kaya and Yildrim (2014) also revealed that students suffer anxiety due to examination, thus s/he tends to score low marks in a science course. However, study by Ayodele (2014) found out that high test anxiety in students makes students succeed academically and develop a favorable attitude towards electro-chemistry (p. 247).

Teacher's behavior can cause anxiety in chemistry subject. Teacher's strictness or leniency can have an impact on students learning and the level of anxiousness. Students believe that lenient teacher will be better as compared to a strict teacher. Lenient teacher facilities better learning because students don't have to stay in stress. Students get the freedom to relax which enable them to learn, think beyond and erase tension. Lenient teachers are frank, approachable which results in effective learning in students. In addition, students' performances will be better and they will have a low level of anxiety. If the teacher is not approachable and strict while teaching, students generates anxiety which is becomes unavoidable barrier to the learners (Kaya & Yildrim, 2014).

Revision Anxiety

Students get anxious because they cannot finish studying the content of the subject as they desire. They usually don't finish revising the content before examination or during annual examination/ class test. Students express that it is very difficult to manage time due to the huge content of the subject. Yunus and Ali (2012), who found out that teacher and students complain that there are too much to learn but time is limited.

During BCSEA examination, students expressed that they get just one or two days off for chemistry paper, students have to rush in order to complete the revision. Since content is huge, students resort, referring only notebooks that decrease their confidence and trust in content coverage creating anxiety and fear. Students refer only notes given by the teacher and depend totally on those notes because they cannot finish the revision if they refer the textbook.

Perception of Chemistry Subject

Students have a psychological mindset that chemistry is the most difficult subject as compared to biology and physics resulting in anxiety. In the study conducted by Abendroth and Friedman (1983), the researcher expressed that these fear might be based on poor experiences or merely on the stereotype students have concerning chemistry.

Chemistry subject has numerical problem and calculation, formula, symbols and complicated equation included in the syllabus. Students need to memorize concepts which are very difficult for students. Among the students, those taking chemistry have fear because they have to deal with calculation and complex equations, and worry about scoring low marks during the examination. The result of the previous study concluded the same result. Anxiety is due to the popular notion that the subject is too wide and demanding. At the same time others, believe that the subject demands lots of calculation and it is difficult to understand

arithmetic (Jegede, 2007). A similar finding was found by Kaya and Yildrim (2014), students with science anxiety tend to find chemistry course unnecessary, boring and difficult. Chemistry deals with formula, memorization, and reasoning which perceive to add fear and anxiety in students.

Comparison of the Degree of Anxiety Students Possess in Urban and Semi-Urban School

The data finding indicated that the degree of anxiety in low achievers seems to be greater as compared to high achievers, whereas the average performers are the most anxious students. Data finding shows that the mean of semi-urban school was higher than the mean of urban school with low and high achiever. Indicating that low and high achieving students of semi-urban had more anxiety compared to students of the urban school. In the study conducted by Jegede (2007), found out that students in the rural area registered more fear in learning chemistry subject than in urban school. The finding from Bihari (2014) oppositely concluded that there is no difference in anxiety between mean scores of rural and urban secondary school students.

This observation could be attributed to various factors, some of which includes:

1. Lack of use of the technological aspect in learning. For instance, students at an urban school can get access to internet easily for video lesson and to understand a difficult concept, whereas students at semi-urban school are mostly with boarding facilities within school campus. Moreover, students are strictly prohibited from using mobile phones. Thus, they are not exposed to technological learning.
2. Proper parental guidance at urban areas as compared to semi-urban school.
3. Urban places have students from the different cultural background.

Relationship Between the Student's Anxiety and Performances in Chemistry Subject

The result found out that there exists a relationship between the anxiety of the students' and marks they obtain during the examination. The result indicated negative relationship exist between anxiety and chemistry performances. Both teachers, as well as students, agreed that chemistry performances depend on the anxiety level of the student. Respondents supported that anxiety is a major factor impacting performances in chemistry subject. Students fail to concentrate on studies and even the concepts that students have understood well becomes difficult for them to retain. Stress can make students sick, experience blackouts and eventually students start missing classes, which affects their end result.

The finding is in consonance with the findings of Vitasari et al. (2010), it was found that study anxiety is negatively related to the academic performances of the students. Previous studies indicated significant correlations between chemistry attitudes, organic chemistry anxiety, and achievement. The result found out that university students with high organic chemistry anxiety had significantly lower scores for achievement (Kurbanoğlu, 2013). The finding is in line with the submission of Shakir (2014), who found a significant relationship between academic achievement and anxiety. It was revealed that anxiety is inversely linked to academic achievements. The finding is consistent with the finding of previous researcher

Ayodele (2014), who found that low stress results in high academic success in electrochemistry. Anxiety have a significant negative effect on performances, a finding which is in line with those of some other studies (Kaya & Yildrim, 2014; Nadeem, Syokwaa, Aloka, & Ndunge, 2014; Shakir, 2014; Stomff, 2014).

Comment [AM15]: Too scanty discussion because it is the heart of you paper. Therefore, exert additional effort to discusse each of your findings.

Comment [AM16]: Think over about you conclusion, findings, and recommendation. Must be congruent with each other

Conclusion

In addition to different causes of anxity, the qualitative analysis indicated that there is one more cause of anxiety, which is labelled as "revision anxiety" generated from this study. It was found out that anxiety can occur because of students' inability to do timely revision during an examination or class test or during study hour. Students find it difficult to finish revisiting contents of chemistry subject.

Low achievers and high achievers admitted from both the schools located at urban and semi-urban that they experience anxiety in chemistry subject. Data collected from AQS, and interview indicated that low achievers are more anxious in comparison to high achievers. Therefore, it was evident to stipulate that low achievers had more anxiety as compared to high achievers.

The result of the study showed that the average performers are most anxious when compared to low and high achievers. Students of the semi-urban school were more anxious than the students of the urban school. This study found that generally, low achievers, as well as high achievers at semi-urban school had a greater degree of anxiety than urban school. Students of the semi-urban school are exposed more towards anxiety compared to students of urban schools. In addition, the group of students who are average performer suffered greater anxiety in chemistry subject.

Evidence from data analysis, there exists a relationship between anxiety and chemistry performances of the students. When anxiety is high in students, performances tend to be low and vice versa. This shows that a negative relationship exists between the degree of anxiety and the performances of students in chemistry subject.

Recommendations

The literature search shows that no instruments exist to measure the chemistry anxiety and no study has been conducted in Bhutan till date. This research paper attempts to provide an avenue for another researcher to explore with other grade levels and subjects across different disciplines. The findings from this study are time-appropriate to apprise educational stakeholders such as planners, administrators, and educational reformers so that relevant strategies can be adopted to overcome the anxiety of the students. Following are some of the recommendation that is generated as the outcome of this study which would be helpful for Royal Education Council (REC), Bhutan Council for School Examinations and Assessment (BCSEA), and Ministry of Education (MoE) for their references. Following are recommendation made to reduce the anxiety for higher secondary students taking chemistry subject.

1. The textbook contains topics which are not in the syllabus. Removing unwanted and irrelevant topic from the textbook so that the textbook becomes handy, comfortable to use and much lighter to carry to the class

2. A collaborative effort between the chemistry department and counseling center holds promise for aiding students. As suggested by Abendroth and Friedman (1983), if counselors come up with treatments designs, it enables students to recognize their chemistry anxiety, talk about it and experience relaxations.
3. Conductive chemistry classrooms and laboratory exercise should be provided to students with proper guidance to reduce anxiety and stress.
4. Students should be given orientation at the beginning, mid and end of the course in order to control the anxiety of students and educate students on how this psychological trait influences chemistry performances.
5. It is vital that a curriculum that is inclusive of strategies of coping with test anxiety be developed.

Comment [AM17]: To who you recommended this?

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