Evaluation of the Causes of Interest Decline in the Subject of Chemistry amongst Secondary and Higher Secondary School Students in Karachi Pakistan

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Abstract

This study aim to determine why high secondary and higher secondary school students are losing their interest in Chemistry. This comparative study polled 450 secondary and higher secondary school students from a private institute of Karachi East. Descriptive analysis was done Using SPSS, result showed that secondary school (grade 10) and higher secondary school (grade 11) students are less interested in chemistry but grade 12 students acted inconsistently. Most students of grade 12 were delighted with grade 11 chemistry's numerical-based themes, while others struggled with equations and IUPAC names in second year. The study began with interviews of first-year students (grade 11), only 10 out of 450 interviewees named chemistry as their favorite subject. Students find chemistry to be a tough subject and not career-related. Personal trait and choice decreased pupils' interest in Chemistry. Students believe that atomic structure, electron location, reaction mechanism, and orbital forms are hypothetical, making it harder to understand. They find experimental chemistry more intriguing because they can see what they are doing. The board syllabus experiments have distinct subjects from the theory syllabus. Audio-visual tools for conceptual learning, trained chemistry teachers, and seminars on "the professional scope of Chemistry courses" might assist improve students' interest in chemistry.

Keywords: Scope of Chemistry, Diminishing Student's Interest, Causes and Affects, Quantitative Approach

Introduction

Students are losing interest in learning science disciplines, particularly chemistry, which presents a difficulty for educational institutions that focus on science (Musengimana, Kampire, & Ntawiha, 2021). During the 20th century, significant advancements were made in the field of chemistry. The incorporation of chemistry into the curricula of primary and secondary schools, either as an integrated component of science classes or as a stand-alone subject, was one of the results of this change. Many teachers of science are of the opinion that encouraging students to adopt a constructive outlook on scientific inquiry ought to be one of the primary focuses of the educational system (Aiken & Aiken, 1969; Koballa, 1988; Laforgia, 1988). One of the most fundamental aspects of science, technology, and industry, chemistry is intertwined with all other areas of study within the scientific community, including biology, mathematics, and physics (Mahdi, 2014). Science and technology have become the standard bearers for the economically sustainable growth of a nation, and the contribution that chemistry makes to both the quality of life and the building of a nation is an absolute necessity (Festus, 2012; Festus, & Ekpete, (2012)).

The study of chemistry is also required before students can move on to more advanced topics such as pharmacy, environmental studies, chemical studies, medicine, and so on. The research found that many people have the common notion that studying chemistry is rather difficult for them. This may be the result of the numerous difficult-to-understand chemical words and invisible chemical ideas that are founded on theories and laws, both of which can make teaching and learning chemistry challenging. This condition has been documented all around the world, which is what prompted the Royal Society of Chemistry (RSC) to begin working on the development of chemistry in the future (Breuer, 2002). The importance of having an interest in studying is something that just cannot be overlooked. In the latter half of the 20th century, the concept of interest began to attract younger students in the realm of science education (Ryan, 2002). Three years of middle school (grades 6-8) are followed by two years of high school in the Pakistani educational system at the secondary level (grades 9–10). The higher secondary and college levels both include (grade 11-12). At the ninth, tenth, eleventh, and twelfth grades, all students participate in required chemistry classes. Students who want to continue their education in science or disciplines related to science at the upper secondary or college levels after completing high school are required to take additional advanced chemistry classes in grades 11 and 12. The curriculum materials in Pakistan place a significant amount of stress on the goal of cultivating students' interest in their studies.

According to Ali (2012), the chemistry curriculum that is prescribed for secondary classes (Grades 10 and 12) includes a wide spectrum of concepts pertaining to organic, inorganic, and physical chemistry that are to be learned and mastered by the students over the course of a period of two years. These concepts are to be learned and mastered by the students. The National Chemistry Curriculum of 2006 for Grades 9 and 10 is a booklet that has been carefully put together. He further expressed that the vast majority of secondary school students who take chemistry are dissatisfied with their educational experiences, both in schools in general and public schools in particular. This dissatisfaction was directed specifically toward their public schooling. The curriculum standards place an emphasis on the acquisition of specialized knowledge, which requires students to have a particular frame of mind, specific abilities, and certain attitudes. There is not much of a connection between the teaching of chemistry and the acquisition of the essential knowledge, skills, and

attitudes that are outlined in the National Curriculum framework. As a direct consequence of this, it might be challenging for students to engage in the type of in-depth learning necessary to acquire content understanding in chemistry. Students who lack a solid foundation, even after successfully completing the Secondary School Certificate examination, are unable to form a meaningful connection with the material being studied. The industrialized nations are already aware of the value of chemistry education to their national economies. Chemistry has a significant impact on a nation's development and quality of life, according to research. Interest, participation, self-efficacy, and success are all depicted in the research on attitudes toward chemistry. Therefore, it is crucial to carry out study on students' attitudes regarding chemistry (Akram, Sami, Ilyas & Ikram, 2018).

Review of Literature

Researchers from all over the world have looked at a wide variety of topics and activities that take place in chemistry classes from a variety of perspectives (Ali, 2012). The major goal of education in the 21st century is to reawaken students' enthusiasm in scientific disciplines like chemistry (Tayyaba & Akram, 2017). The level of interest that students have in the chemistry curse can be influenced by a variety of factors. Several studies have identified a variety of factors that contribute to students' lessening interest in science and negative attitude toward the subject. Personal characteristics such as gender, grade level pedagogical features, audio-visual aids utilized by the instructors and career opportunities are among these determinants (Whitelegg, 2006; Tracey, 2002; Semela, 2010; Rodrigues, 2007). It is possible for these elements to change from one student to the next; however, the differences are typically more pronounced between countries. The trait of having personal relevance is what is meant by interest. The fact that the material was presented without any connection to real-world issues was the primary cause of the students' lack of interest (Krapp, 2005). The experiments have the potential to be an important instrument for the formation of interests that are more consistent, which, in turn, influences the selections of courses, higher studies, and jobs (Krapp & Prenzel, 2011). When students attend their secondary school science classes, they carry with them an attitude of natural curiosity (Krapp & Prenzel, 2011).

Montes, Ferreira, and Rodriguez (2018), carried out a study in which they investigated the attitudes of secondary school students toward chemistry. They also evaluated the impact of factors such as the type of school, the year group, gender, and the level of chemistry achievement on both cognitive and affective dimensions. 523 Chilean secondary school students came from public, private, and private schools that were sponsored by the government to take part in the study. According to the findings of the research, views toward science are neither good nor negative, which is a reality that is comparable to that of other nations. The outcomes of both unilabiate and multivariate analyses of variance revealed statistically significant relationships between levels of chemistry achievement and both year group and attitude toward the subject of chemistry. There were no observed effects of the type of school attended, gender, or relationships between factors. Follow-up analyses found that students' attitudes become less favorable as they progress through the school years; nevertheless, the higher the students' chemistry grades, the more positive their attitudes become regarding chemistry. Yunus and Ali (2012) conducted a study that demonstrated the majority of urban students had a favorable attitude toward learning chemistry when they undertake chemistry activities in the laboratory. The findings of this study were presented in the form of a conclusion. The findings also demonstrated that the vast majority of students had a negative attitude toward chemistry due to their lack of interest in both the subject matter and the curriculum itself.

The researchers Musengimana, Kampire, and Ntawiha (2021) analyzed the literature with a focus on how different elements affect the way high school students feel about chemistry. The years 1977-2019 were used to pull 36 relevant studies from Google Scholar and the ERIC database. Results indicated that good attitudes toward chemistry were most strongly associated with students' gender, teachers' pedagogical approaches, and academic year. Students' attitudes toward chemistry were investigated by looking for links to other variables, such as their level of interest in the subject, the classroom atmosphere, the curriculum's relevance, teachers' behavior, students' perceptions of the subject's difficulty, and students' levels of self-directed effort. The results showed that these factors need to be managed to increase secondary students' enthusiasm for chemistry and boost their academic achievement in the subject. There has been a lack of concern raised in Pakistan over the construction of interest in science subjects, which has led to the education of science students being disregarded. When it comes to the students' enthusiasm in science, and more specifically in the subject area of chemistry, there is a significant amount of space for improvement. The success of this endeavor depends on the concerted efforts of educators, parents, educationists, and only sustained conflict in this arena can bring success.

Research Methodology

Research Design

The overall plan for connecting the conceptual research problems to the relevant and doable empirical research is referred to as the research design. It is an investigation that lays out in detail the steps that should be taken in a research project (Creswell, 2014). According to Creswell (2014), academics need to take the time to consider the fresh perspectives and theoretical stances that they are bringing to any particular field of research. They need to give some thought to the approaches they intend to take in their research, as these will serve as the foundation for their methodology. For the purpose of this study, a quantitative research design was chosen (Creswell, 2002) with a descriptive approach. According to (Creswell, 2002), quantitative research can be traced back to its origins in the physical sciences, more specifically chemistry and physics and in descriptive approach, the characteristics of a particular event are identified based on observation, or correlations between two or more phenomena are investigated. Both of these types of research are examples of qualitative research as well. Descriptive research can also be conducted with the use of statistics. The primary goal of this kind of research is to characterize the information and properties of the subject that is being studied. It does not explain how, when, or why the qualities developed in the way that it describes. Instead, it provides an answer to the question "what" (i.e., what are the traits of the group or circumstance being researched) When attempting to define a situation or a population, it is common practice to make use of some kind of categorization framework, which may also be referred to as descriptive categories. Investigating things like averages, frequencies, and other statistical computations are the primary focuses of this kind of research. In the current study a descriptive approach is employed so that a subject can be comprehended on a deeper level. More specifically, focus on the past rather than the present or the future. In this study the purpose of descriptive research is also investigate the most recent occurrences regarding the interest decline of the students in chemistry subject.

Data collection

To achieve the research goal of this study, data was collected (n=450) science students from a private sector institute of a secondary and higher secondary level from Karachi Pakistan. Observations gleaned from survey research can be categorized as either cross-sectional or longitudinal studies. In a cross-sectional study, the observations are carried out at one or more points in time, whereas in a longitudinal study, the observations are carried out at multiple points in time over the course of the investigation. A longitudinal survey focuses on trend analysis, while a cross-sectional research design is descriptive, exploratory, and explanatory. Panel and cohort designs are used in cross-sectional research (Jongbo, 2014). For the purpose of data collection, it makes use of either questionnaires or interviews that are structured, and its ultimate goal is to generalize the sampled data to a population (Fowler & Cosenza, 2009; Fowler, 2009). There is a wide range of options for conducting surveys, but the ones that are most frequently used are faceto-face interviews, telephone interviews, internet surveys, and mail surveys. Utilizing this strategy to collect information regarding what, why, and how many can be beneficial (Mugenda & Mugenda, 2003). The research technique of surveys can be further subdivided into the following categories: descriptive surveys (survey testing method, questionnaire survey method, and interview survey method); analytical surveys (documentary frequency survey, observational survey, rating survey, critical incident survey, and factor analysis survey); school surveys; and genetic surveys (Singh, 2006). In this study the main purpose to employed survey research was that the school survey is an attempt to measure the impact that objective characteristics have on individuals. It is concerned with both the objective aspects of educational institutions, such as the administrative provisions and practices of those institutions, as well as the educational attainments of the students who attend those institutions.

Instrumentation

A questionnaire was designed to collect the students' feedback on a series of closed-ended questions. There were two parts to the questionnaire: the first asked for basic demographic information (gender, grade, school, parents' professions, students' previous and current areas of study, scores, and ages), and the second contained the test questions, of which there were a total of 31 (23 yes/no and 8 no/yes). Students' demographic details (gender, grade, school, parents' professions, previous and present fields of study, test scores, etc.) were collected in the first section of the questionnaire. The demographic characteristics were listed in the first section of the document, and the test items were listed in the second section. The statements that make up the questions on the exam are organized according to the following rubrics: (1) the students' present degree of interest in chemistry; (2) the students' personal choices; (3) the role of the instructor; and (4) the professionals' professional scope. The students' comments have been collated. Using a five-point Likert scale, they gave the following responses: strongly disagree = 1, disagree = 2, undecided = 3, agreement = 4, and strong agreement = 5. Experts reviewed the questionnaire, and a pilot study with 50 people was conducted to gauge the questionnaire's reliability. For this study, we counted as a potentially-accessible group students taking chemistry as one of their obligatory

science courses. The population included both secondary and higher secondary school students. In total, 450 students were selected through convenience sampling to take part in the study.

Analyzing the Data and Obtaining the Results

Discussion

Chemistry Students' current levels of interest in the subject of Chemistry

Although the pupils' interest in chemistry was commendable, There was nothing about it that stood out as particularly exceptional. The chemical experiments that obtained the highest mean and standard deviation scores (Mean = 4.28, SD = 1.18) were the ones that caught the interest of the students the most. On the other hand, the responses of the students indicated a low degree of interest in the careers that are based on the chemistry discipline (mean = 1.34, standard deviation = 1.29). The vast majority of students (M=3.09, SD=1.37) were under the impression that jobs in the chemical industry were boring and uninteresting. The students reported that they liked their chemistry classes (Mean: 3.85, standard deviation: 1.25) and that they were pleased to be enrolled in the chemistry program (Mean= 3.56, standard deviation= 1.20). In a similar vein, the students reported that performing research related to the subject of chemistry was not something that piqued their interest (Mean = 3.34, SD = 1.25). It was found that students in the 10th grade had a substantially higher degree of interest in the chemistry course (Mean =3.49) than those in the 9th grade (Mean =3.25). This was the conclusion drawn from the data. There was a noticeable disparity in the level of interest shown by students who were enrolled in one of three unique levels, either secondary, first year, or second year of study respectively. The level of interest in chemistry that students had gradually decreased as they moved from lower to higher levels of schooling (from 9th to 2nd year), as indicated by the Mean values, which were 3.49 for secondary school, 3.35 for first year, and 3.26 for second year. In other words, students' levels of interest in chemistry gradually decreased as they moved from lower to higher levels of schooling. Students who attend this school, the majority of whose students have parents who are in the military, have a greater propensity to be interested in joining the navy themselves and following in the footsteps of their fathers and mothers. Therefore, the primary reason why students should make the effort to study chemistry is so that they can work together after they have completed the intermediate level, just like their parents and grandparents did before them.

Chemistry interest factors

Based on the findings of the investigation into the component under "Personal Choices," it was discovered that pupils had an unfavorable attitude toward chemistry. The students' highest level of agreement on chemistry having many pseudo theoretical notions with many exceptions and creativity (Mean = 4.22, SD = 1.51) was the most significant element of their personal distaste of the chemistry course, and it was the reason why they disliked it the most. Their limited perspective on the breadth of research possible in the subject of chemistry (Mean = 3.42, standard deviation = 1.63) is the aspect that is the most discouraging. The students had a positive attitude toward their chemistry class (Mean= 3.55, standard deviation=1.26) and believed that having knowledge of chemistry was beneficial for everyday life (Mean= 3.60, standard deviation=1.15).

Chemistry Teachers performance

The students were satisfied with the performance of their chemistry teachers because there was a significant agreement between the mean values for the elements of the questionnaire that corresponded to each other. (Standard Deviation = 1.33) The pupils in the chemistry class felt that the techniques of instruction that were used by the teachers were adequate. Cross-questioning was one strategy that teachers used (Mean = 3.44, standard deviation = 1.35) to keep their students engaged and attentive. When it came to how the teacher interacted with each student in chemistry class, the mean score was 3.40, and the standard deviation was 1.34. Disagreements arose in response to the following statements regarding chemistry teachers: a) teachers rarely use charts, models, and examples from daily life to teach their students (Mean = 3.07, SD = 1.51); b) teachers do not regularly assess their students (Mean = 3.24, SD = 1.33); and c) teachers do not give their students extra time (Mean = 3.28, SD = 1.42).

The Professional Scope of Chemistry

The majority of the polled students have negative and highly negative opinions regarding the Professional Scope of Chemistry. First, students had the opinion that teaching was the only work that they could join after having majored in chemistry (mean = 3.96, standard deviation = 1.04). Second, the students demonstrated that activities based on chemistry are monotonous and uninteresting (Mean = 3.90, SD = 1.27). Students believe that the scope of action that can be covered by chemistry is narrow (mean = 3.03, standard deviation = 1.34). On the other hand, students had a negative reaction to the popularity of chemistry-based art (Mean = 2.34, SD = 1.29) but discovered that it was popular and a good source of revenue (Mean = 3.30, SD = 1.34)

Conclusion

The current study came to the conclusion that students' levels of interest in majoring in chemistry were low because students were interested in majoring in chemistry yet doubtful about it. The students showed a strong interest in doing chemical experiments, but they showed little enthusiasm for activities and research in the field of chemistry that were focused on chemistry itself. While the pupils at the college showed relatively little interest in chemistry, the students at the school showed a great deal of enthusiasm. The children of the parents who were connected to the marine services had little interest in chemicals, even if their father was involved in a variety of occupations. The declining interest in chemistry among students occurred gradually. Personal Decisions have been one of the many key variables that have contributed to the growth of student interest in chemistry was the component that had a significant negative impact on the students' interest. Students' interest in chemistry can be increased by the use of suitable instruction, despite the fact that professors have not been the primary reason of students' interest in the subject. There was not a discernible gender difference in the effect that Factor Role of Teacher had on the students. The work that my father did had very little of an impact on personal decisions or the role

that teachers play. Students' perceptions of the "Professional Scope of Chemistry" can be broken down into only two categories: grade level (9th and 10th) and the occupation of the student's father.

Suggestions

The findings suggest that concerns should be raised about how student interest in various areas of scientific education is measured. It is important for Pakistan to participate in international audits like PISA and TIMMS, both of which evaluate interest-building efforts. Male students, who, in comparison to female students, tend to exhibit a lesser level of interest in chemistry, deserve special consideration as well. It is recommended that the theoretical component of the curriculum, which is offered in textbooks, be matched more closely with the chemical tests that are included in the curriculum. It has the potential to assist in cultivating students' interests in the theatre component. The educational materials that teachers use to teach chemistry ought to be on the cutting edge. Regularly, teachers should provide comments and assessments to students based on a variety of chemistry-related views. For the purpose of inspiring and motivating pupils, there ought to be relevant lectures, debates, and field trips. Competency tests ought to be administered by educational institutions in order to assist students in selecting the appropriate courses at the appropriate times. Students should have access to career counselling services in schools so that they can become familiar with a diverse variety of scientific domains and subjects related to art. The government, the business community, and the industrial sector all need to take decisive and efficient action to boost the significance of endeavors related to scientific research and development.

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