The Role of Resilience for Developing the Self-Efficacy Among Chemistry Students in Pakistan

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ABSTRACT
This study aimed to explore the role of resilience for developing the self-efficacy among chemistry students in Pakistan. Self-efficacy refers to an individual's belief in their ability to perform a specific task or achieve a particular goal. Resilience refers to an individual's ability to bounce back from adversity and overcome challenges. The present qualitative study directed interpretivism as paradigm and adopted the qualitative research design. The chemistry teachers were the population of the research study. Four (04) participants were selected from the population on the basis of purposive sampling. Semi-structured interviews were conducted for the collection of data; as semi-structured interviews were used for deep and in-depth study. The researcher used the intelligent transcription for the purpose of the data collection. The results of the study showed that the nature of chemistry education is predominantly theoretical, with a lack of practical applications. This presents a challenge for students in understanding the subject matter. The role of teachers in chemistry education is also significant. Strategies for improving chemistry education include creating positive change in the subject, improving student understanding of chemistry, and developing innovative teaching methodologies. It is also essential to help students develop the ability to recover from setbacks and build their confidence through positive reinforcement.

KEYWORDS
Resilience, Self-efficacy, Chemistry, Students

INTRODUCTION
Confidence level of the students, coping ability, and capacity of the individuals to overcome the issues and problems regarding learning process, is alarming in Pakistan. Individual’s belief on their abilities is very low so their coping abilities and bounce back tendency for minimizing such issues remain below the required standards. In this way, students’ abilities were affected adversely. This situation creates the interaction gap between students and teachers.

According to Moreno et al. (2021), Chemistry is a challenging subject that requires a significant amount of effort and persistence to master. In Pakistan, where the education system is highly competitive, many chemistry students face a range of academic and personal challenges that can impact their self-efficacy and academic performance (Lakhan et al., 2020; Siddique et al., 2021).

Self-efficacy refers to an individual's belief in their ability to perform a specific task or achieve a particular goal. It is a crucial factor in academic achievement, as students who have high levels of self-efficacy are more likely to set ambitious goals, persist in the face of setbacks, and ultimately achieve better academic outcomes (Moreno et al., 2021; Naibert et al., 2021).

Resilience, on the other hand, refers to an individual's ability to bounce back from adversity and overcome challenges (Lakhan et al., 2020; Sajjad, 2021). It is a key factor in developing self-efficacy, as students who are resilient are better able to cope with academic and personal stressors and maintain a positive outlook on their abilities and potential. Given the importance of self-efficacy and resilience for academic success, there is a growing interest in exploring the role of resilience in developing self-efficacy among chemistry students in Pakistan (Siddique et al., 2021). This research aims to identify the factors that contribute to resilience and self-efficacy in chemistry students, as well as to develop strategies to enhance these qualities among students who may be struggling with academic or personal challenges (Konaszewski et al., 2021). The findings of this research can have important implications for the development of educational policies and programs that aim to support the academic success and well-being of chemistry students in Pakistan.

Self-efficacy and especially resilience are very important constructs in the context of students, theses constructs acquire more attention and importance during the era of COVID-19 (de la Fuente et al., 2021; Etherton et al., 2020), when facing the threat and fear (Green, 2022). Only few research studies have been conducted on these constructs specially on resilience, furthermore the researchers pay more attention on the quantitative studies (Hassan, 2019; Hassan & Butt, 2021; Mirza & Arif, 2018; Siddique et al., 2021) as well as mix-method (sequential explanatory design) studies (Chan et al., 2022; Myers-Coffman et al., 2019; Whiting et al., 2019) but the attention on the qualitative study was very parsimonious. Chemistry which is consider very dry, tough and painstaking is the attention of the researcher in the Pakistani environment (Kanwal et al., 2022; Sajjad et al., 2022; Siddique et al., 2021).
Although there is some research on the role of resilience and self-efficacy in academic achievement, there are still several research gaps that need to be addressed in the context of chemistry students in Pakistan. Research gap is a problem or area or a question which is not answered or has insufficient problem in the research study (Fergnani, 2019; Ford et al., 2021), furthermore it is the problem identified by the new researcher after the detailed study of the previous research studies (Joyce & Cartwright, 2020; Neal et al., 2019; Zainuddin et al., 2019; Zhang & Shaw, 2020). Various research studies have been conducted in medical (Hinz et al., 2019; Lin et al., 2020; Liu et al., 2018; Yang et al., 2019), nursing (Wang et al., 2018; Warshawski, 2022; Zhang et al., 2022), psychology (Mao et al., 2020; Wu et al., 2021), sociology (Konaszewski et al., 2021; Wen et al.). Furthermore, these constructs have been discussed in education as well in the different context (Hayat et al., 2021; Tsibidaki, 2021; Yada et al., 2021) but not in the context of chemistry specially. So, it is the need of hour that research may conduct in chemistry as well. The first proponent in the context of resilience in Pakistani context is Sarwar (2010).

On the basis of the literature review the researcher framed the following objective of the study

- Exploring the Role of Resilience for Developing the Self-Efficacy Among Chemistry Students in Pakistan.
- Literature review of the research studies set the trend of the researcher for the further development in research. In this research study, resilience and self-efficacy are the main construct for exploration. The first known use of self-effacing was in 1854. Self-efficacy theory was first described by Albert Bandura in 1977 in an article in the journal Psychological Review titled “Self-Efficacy: Toward a Unifying Theory of Behavioral Change. He was known for his contributions to the field of social cognitive theory, which stated that learning and behavior was heavily influenced by the environment, social interactions, and the individual's own thoughts and beliefs. He believed that people's beliefs about their capabilities to organize and execute courses of action played a major role in determining their success. Bandura identified four sources of self-efficacy: mastery experiences, vicarious experiences, verbal persuasion, and physiological states. Self-efficacy was originally used to explain the success of behavior change interventions. In the 1980s, it was applied to the workplace and education, where it has been used to explain why people are motivated to pursue certain goals, cope with stressful situations, and increase their performance. It has been found to be a contributing factor in job performance, academic achievement, health behaviors, and career choice. Today, self-efficacy remains a popular topic in research and is widely used by practitioners in the fields of psychology, education, and business (Elgendi et al., 2021; Ghalavandi et al., 2020; Gross, 2021; Irie, 2021).

FACTORS AFFECTING SELF-EFFICACY

Self-efficacy is the belief in one's own ability to successfully perform a task or achieve a specific goal. There are several factors that can affect a person's self-efficacy, including:

1. **Mastery experiences:** Success in previous similar tasks or activities can increase a person's self-efficacy, while failure can decrease it.
2. **Vicarious experiences:** Observing others succeed or fail in similar tasks can also influence self-efficacy.
3. **Social persuasion:** Encouragement and feedback from others, such as friends, family, or a coach, can impact self-efficacy.
4. **Cognitive appraisal:** A person's own evaluation of their skills, abilities, and performance can affect their self-efficacy.

Overall, a person's self-efficacy can be influenced by a complex interplay of internal and external factors, including past experiences, social support, and personal beliefs and attitudes. According to the Gebauer et al. (2020) and Mohammadi et al. (2021) people’s beliefs in their capabilities to produce desired effects by their own actions

The word "resilience" first appeared in English in the late 16th century, derived from the Latin resilire, which means "to jump back". It was originally used to describe an object's ability to absorb energy and return to its original shape after being bent or compressed. By the early 19th century, the word was being used to describe the ability of people to recover from adversity or difficult situations. In the 20th century, the term was broadened to encompass the ability of individuals, communities, and ecosystems to adjust to changing circumstances, including stress and adversity. Today, resilience is used to describe the capacity of individuals, communities, and ecosystems to cope with stress and adversity and to adapt and thrive in the face of change.

FACTORS AFFECTING THE RESILIENCE IN EDUCATION

1. **Access to Quality Education:** Access to quality education is essential for building a resilient education system. Providing students with access to quality educational resources, materials, and teaching staff can help ensure that they have the skills and knowledge they need to be successful in the future.
2. **Positive Learning Environment:** A positive learning environment can help build resilience in education. Creating an atmosphere where students feel safe and supported can foster greater engagement and creativity in the classroom.
3. **Social and Emotional Learning**: Social and emotional learning (SEL) is an important factor in building resilience in education. Teaching students how to manage their emotions, recognize and respond to the feelings of others, and develop healthy relationships can help them cope with challenges.

4. **Mental Health Support**: Mental health support can be a key factor in promoting resilience in education. Providing students with access to mental health resources such as counseling, therapy, and support groups can help them manage stress and cope with difficulties.

**CONCEPTUAL FRAMEWORK**

Siddique et al. (2021) conduct the research study in Pakistan on chemistry study with the sample of 250, and findings of the study were that was is strongly positive correlation between resilience between self-efficacy. A research study was formulated by Pradana and Ismara (2013) on the resilience and self-efficacy, the findings of the study were that there was significant positive correlation between resilience and self-efficacy. A research study was developed in Israel on the 222 nursing students, the findings of the study reveals that correlation were found between self-efficacy, resilience and social support (Warshawski, 2022). A research study was conducted on the 428 secondary school teachers in Malaysia, the results of the study showed that there was positive and significant correlation between resilience and crisis self-efficacy (Baguri et al., 2022). Similarly, another research study was conducted in Turkey on self-efficacy and psychological resilience, the sample of the study were 485 6th grade students, the results of the study revealed that there was significant and positive correlation between psychological resilience and self-efficacy (Oktay et al., 2021). A research study was conducted in Malaysia on Malaysian-Indian adolescent with the sample of 86 individuals having 40 male and 46 female by purposive sampling, and results revealed that there was positive and significant relationship between resilience and self-efficacy (Ganaprapkasam et al., 2020b).

A research study was conducted on the relationship between resilience, self-efficacy and empowerment in special disable students with 882 individuals in USA, findings of the study revealed that there was weak positive correlation between self-efficacy and resilience (Ordway et al., 2020). A further research study was conducted on resilience and self-efficacy in life skill from early to late adolescent in Italy with 302 individuals, the results shows that there is moderately positive correlation between resilience and self-efficacy (Sagone et al., 2020).

**RESEARCH METHODOLOGY**

The present qualitative study directing interpretivism as paradigm and adopted the qualitative research design. Qualitative research methodology makes use of open-ended questions and motivates participants to express their thoughts and views openly with no limitations (Chih-Pei & Chang, 2017; Dodgson, 2017). The group of the elements/individuals from which participants/subjects are selected is known as population (Jabeen et al., 2022; Siddique et al., 2022). The chemistry teachers were the population of the research study. A group of subjects those are used for data collection is called sample (Nasrin Akhter et al., 2021; Nasrin Akhter et al., 2021). Four (04) participants were selected from the population on the basis of purposive sampling; as Campbell et al. (2020), Vasilieou et al. (2018) and Robinson (2014) say that a sample size between 3 and 16 is sufficient when results target a specific group and are not intended to generalize to the larger population. Semi-structured interviews were conducted for the collection of data; as semi-structured interviews were used for deep and in depth study (Magaldi & Berler, 2020). The researcher used the intelligent transcription for the purpose of the data collection, the intelligent transcription is type of transcription in which researcher transcribe the material which is related to the research problem only; it is a basically a process in which researcher formulate the complete record in of written as well as written spoken material the form of words (Adler, 2022; Knott et al., 2022).

**DATA ANALYSIS**

1. **Characteristics of Chemistry Education**
   - Theoretical nature of chemistry education
   - Lack of practical applications in chemistry education
   - The difficulty and challenges of studying chemistry

Based on the responses of the four participants, here is an analysis of the characteristics of chemistry education:

**Theoretical nature of chemistry education**: Participant 1 agrees that chemistry education is highly theoretical and abstract, but feels that it is necessary to understand the fundamental principles of chemistry. Participant 2 also agrees that chemistry education is highly theoretical, but feels that it is necessary for building a strong foundation in the subject. Participant 3 feels that the theoretical nature of chemistry education can be overwhelming and confusing for some students, but recognizes that it is necessary for understanding the subject. Participant 4 agrees that chemistry education is highly theoretical and abstract, but feels that this is necessary for building a strong understanding of the subject.

**Lack of practical applications in chemistry education**: Participant 1 feels that there are not enough opportunities for hands-on learning and real-world applications in chemistry education, which can make it difficult to see the relevance of
the subject to everyday life. Participant 2 agrees that there is a lack of practical applications in chemistry education, but feels that this can be addressed through more hands-on learning experiences and real-world examples in the classroom. Participant 3 believes that there are not enough opportunities for hands-on learning and real-world applications in chemistry education, which can make it difficult to engage with the subject. Participant 4 acknowledges that there is a lack of practical applications in chemistry education, but feels that this can be addressed through more hands-on learning experiences and real-world examples in the classroom.

**Difficulty and challenges of studying chemistry:** Participant 1 acknowledges that chemistry can be challenging due to its complex theoretical concepts and mathematical equations, but feels that with enough practice and dedication, anyone can succeed in the subject. Participant 2 acknowledges that chemistry can be a difficult subject, but feels that it is a rewarding challenge that requires perseverance and dedication. Participant 3 acknowledges that chemistry can be challenging, but feels that with the right support and resources, students can overcome these challenges and succeed in the subject. Participant 4 believes that chemistry can be a challenging subject, but feels that this is part of what makes it interesting and rewarding to study.

Overall, the data suggests that the theoretical nature of chemistry education, lack of practical applications, and difficulty and challenges of studying chemistry are common characteristics of chemistry education that are recognized by these participants. However, there are also suggestions for how to address these issues, such as incorporating more hands-on learning experiences and real-world applications into the classroom, and providing appropriate support and resources for students.

2-The Role of Teachers in Chemistry Education

- The importance of teachers in chemistry education
- The challenges faced by teachers in teaching chemistry

On the basis of the responses, the data analysis for the role of teachers in chemistry education based on the responses of the four participants is as:

**The importance of teachers in chemistry education:** All four participants agreed that teachers play a critical role in chemistry education. Participant 1 emphasized that teachers can inspire and motivate students to learn, and that they are essential for creating a positive classroom environment. Participant 2 highlighted the importance of teachers in explaining complex concepts and providing guidance and support to students. Participant 3 noted that teachers can foster critical thinking and help students connect theoretical concepts to real-world applications, while Participant 4 emphasized the role of teachers in facilitating student engagement and interest in the subject.

**The challenges faced by teachers in teaching chemistry:** Participants identified several challenges that teachers face in teaching chemistry. Participant 1 noted that teachers may struggle to balance the need for theoretical understanding with practical applications and may find it challenging to teach abstract concepts to students. Participant 2 discussed the difficulty of keeping students engaged and interested in the subject, particularly when students may not see the relevance of chemistry to their daily lives. Participant 3 mentioned the challenge of managing diverse student learning styles and abilities, while Participant 4 emphasized the challenge of staying up-to-date with advancements and changes in the field of chemistry.

Overall, the data suggests that teachers play a crucial role in chemistry education and face a variety of challenges in their teaching. Addressing these challenges, such as finding ways to keep students engaged and interested, managing diverse student learning styles, and staying current with advancements in the field, may be key to improving the quality of chemistry education and helping students succeed in the subject.

3-Challenges Faced by Students in Chemistry Education

- The perceived lack of importance of chemistry education among students
- The impact of failure on student confidence in chemistry education
- The difficulty of adjusting to chemistry education after failing
- Identifying the reasons for failure in chemistry education
- The importance of counseling and support for struggling students
- Differences in academic performance and confidence levels between urban and rural students in chemistry education

The data analysis of the challenges faced by students in chemistry education based on the responses of the four participants:

**The perceived lack of importance of chemistry education among students:** Participants 1, 2, and 4 mentioned that students may perceive chemistry education as less important than other subjects or may not see its relevance to their future careers. Participant 1 noted that students may struggle to understand the real-world applications of chemistry and may find it challenging to connect theoretical concepts to practical situations. Participant 2 emphasized the importance of making
chemistry education more engaging and relevant to students to overcome this perception, while Participant 4 suggested that incorporating real-world examples and applications may help students see the relevance of the subject.

The impact of failure on student confidence in chemistry education: All four participants agreed that failure in chemistry education can have a significant impact on student confidence and motivation. Participant 1 mentioned that students may feel discouraged and may lose confidence in their ability to learn the subject. Participant 2 highlighted the importance of providing constructive feedback and support to students to help them overcome failures and build their confidence. Participant 3 noted that students may benefit from learning effective study skills and strategies to improve their performance in the subject, while Participant 4 emphasized the importance of providing counseling and support to struggling students.

The difficulty of adjusting to chemistry education after failing: Participants 1 and 2 mentioned that students may find it challenging to adjust to chemistry education after failing, particularly if they feel they have a weak foundation in the subject. Participant 1 suggested that teachers may need to use different teaching strategies and approaches to help struggling students catch up, while Participant 2 emphasized the importance of building a strong foundation in basic concepts before moving on to more complex topics.

Identifying the reasons for failure in chemistry education: Participants 2, 3, and 4 noted that identifying the reasons for failure in chemistry education is essential for helping students overcome their challenges. Participant 2 suggested that teachers should provide feedback and guidance to students to help them identify areas for improvement, while Participant 3 emphasized the importance of assessing student learning styles and identifying strategies that work best for individual students. Participant 4 mentioned that identifying the root causes of failure, such as lack of motivation or learning difficulties, may help teachers provide targeted support and counseling to struggling students.

The importance of counseling and support for struggling students: All four participants emphasized the importance of counseling and support for struggling students in chemistry education. Participant 1 suggested that teachers should provide individualized attention and support to struggling students, while Participant 2 emphasized the importance of creating a supportive and encouraging classroom environment. Participant 3 highlighted the role of counseling services in helping students cope with stress and anxiety related to academic performance, while Participant 4 mentioned that peer mentoring programs and tutoring services may also be helpful for struggling students.

Differences in academic performance and confidence levels between urban and rural students in chemistry education: Participant 3 mentioned that there may be differences in academic performance and confidence levels between urban and rural students in chemistry education. They suggested that this may be due to differences in access to resources, such as qualified teachers and well-equipped laboratories, and recommended that policymakers should focus on addressing these disparities to ensure that all students have access to high-quality chemistry education.

Overall, the data suggests that students face a range of challenges in chemistry education, including the perceived lack of importance of the subject, the impact of failure on student confidence and motivation, and the difficulty of adjusting to the subject after failing. Identifying the reasons for failure, providing counseling and support to struggling students, and creating a supportive and engaging classroom environment may be key to addressing these challenges and helping students succeed in chemistry education.

4-Strategies for Improvement in Chemistry Education

- Creating positive change in chemistry education
- Improving student understanding of chemistry
- Innovative teaching methodologies in chemistry education
- Developing the ability to recover from setbacks in chemistry education
- Building student confidence in chemistry education through positive reinforcement
- The impact of urban and rural environments on academic performance and strategies to address these differences in chemistry education.

The data analysis of the strategies for improvement in chemistry education based on the responses of the four participants:

Creating positive change in chemistry education: Participants 1 and 3 suggested that creating positive change in chemistry education is essential for improving student outcomes. Participant 1 emphasized the need for a curriculum that is relevant, engaging, and meaningful to students, while Participant 3 highlighted the importance of incorporating real-world applications of chemistry into the curriculum to help students understand the subject's relevance.

Improving student understanding of chemistry: All four participants agreed that improving student understanding of chemistry is critical for success in the subject. Participant 1 suggested that teachers should focus on building a strong foundation in basic concepts and providing hands-on opportunities for students to apply their knowledge. Participant 2 emphasized the importance of providing clear explanations and feedback to students to help them identify areas for improvement. Participant 3 recommended that teachers should use a variety of teaching methods and strategies to cater to
different learning styles, while Participant 4 highlighted the importance of providing additional support and resources, such as tutoring and mentoring programs, to help struggling students.

**Innovative teaching methodologies in chemistry education:** Participants 1 and 3 suggested that innovative teaching methodologies can help improve student engagement and understanding in chemistry education. Participant 1 recommended the use of interactive and collaborative teaching methods, such as group discussions and project-based learning, while Participant 3 suggested the incorporation of multimedia and technology to enhance student learning.

**Developing the ability to recover from setbacks in chemistry education:** Participants 2 and 4 noted that developing the ability to recover from setbacks is crucial for success in chemistry education. Participant 2 suggested that teachers should provide constructive feedback and support to help students learn from their mistakes and improve their performance, while Participant 4 recommended that teachers should focus on building student resilience and perseverance.

**Building student confidence in chemistry education through positive reinforcement:** All four participants agreed that building student confidence is essential for success in chemistry education. Participant 1 suggested that teachers should provide positive reinforcement and recognition to students for their efforts and achievements, while Participant 2 recommended the use of peer mentoring and support programs to help students build confidence. Participant 3 suggested that teachers should use a growth mindset approach to help students develop a positive attitude towards learning and overcome challenges, while Participant 4 emphasized the importance of creating a supportive and encouraging classroom environment.

**The impact of urban and rural environments on academic performance and strategies to address these differences in chemistry education:** Participants 2 and 4 noted that there may be differences in academic performance between urban and rural students in chemistry education. Participant 2 suggested that teachers should be aware of these differences and tailor their teaching methods accordingly, while Participant 4 recommended that policymakers should focus on addressing disparities in access to resources, such as qualified teachers and well-equipped laboratories, to ensure that all students have access to high-quality chemistry education.

Overall, the data suggests that there are several strategies for improving chemistry education, including creating positive change, improving student understanding, using innovative teaching methodologies, developing resilience and perseverance, building student confidence, and addressing disparities between urban and rural students. Incorporating these strategies into chemistry education may help improve student outcomes and provide a more engaging and meaningful learning experience for students.

**DISCUSSION**

The first theme is the characteristics of chemistry education, which include the theoretical nature of the subject, the lack of practical applications, and the difficulty and challenges of studying chemistry. These findings are consistent with previous studies that have identified chemistry as a challenging subject due to its abstract and theoretical nature, which can make it difficult for students to understand the subject matter without practical applications or hands-on activities (Pradana & Ismara, 2013; Warshawski, 2022). Moreover, chemistry education often requires a high level of abstract thinking and problem-solving skills, which can be difficult for some students.

The second theme is the role of teachers in chemistry education, which includes the importance of teachers in helping students understand the subject matter and the challenges faced by teachers in teaching chemistry. Previous research has emphasized the significance of the teacher-student relationship in the success of chemistry education (Sajjad et al., 2022; Warshawski, 2022). Teachers play a crucial role in creating a positive and engaging learning environment that fosters student motivation, interest, and participation. However, teaching chemistry can be challenging for teachers due to the complexity of the subject matter and the need for effective communication and pedagogical strategies.

The third theme is the challenges faced by students in chemistry education, which includes the perceived lack of importance of chemistry education, the impact of failure on student confidence, and the difficulty of adjusting after failing. These findings are consistent with previous research that has identified student motivation and confidence as critical factors that influence student performance and success in chemistry education (Ganaprakasam et al., 2020a; Oktay et al., 2021). Additionally, the challenges faced by students can vary depending on their academic backgrounds and socio-economic factors, including urban and rural environments.

The fourth theme is strategies for improvement in chemistry education, which includes creating positive change, improving student understanding of chemistry, developing innovative teaching methodologies, and building student confidence through positive reinforcement. These strategies are consistent with previous research that has emphasized the importance of incorporating hands-on activities, interactive learning, and technology-based tools to improve student engagement and motivation in chemistry education (Ordway et al., 2020; Sagone et al., 2020). Additionally, addressing the differences in academic performance and confidence levels between urban and rural students requires targeted interventions and support services that are tailored to the unique needs of each group.

In conclusion, the findings of this data suggest several critical themes related to chemistry education, including the characteristics of the subject, the role of teachers and students, and strategies for improvement. These themes highlight the
importance of addressing the challenges faced by students and teachers and developing innovative strategies to improve the quality of chemistry education.

FINDINGS

The findings of this data suggest several key themes in chemistry education. First, the nature of chemistry education is predominantly theoretical, with a lack of practical applications. This presents a challenge for students in understanding the subject matter. Additionally, students perceive chemistry education as difficult, which further adds to the challenges they face.

The role of teachers in chemistry education is also significant. They play a crucial role in helping students understand the subject matter and in addressing the challenges that students face in learning chemistry. However, teachers face their own challenges in teaching chemistry, including finding innovative ways to make the subject more accessible and engaging for students.

The challenges faced by students in chemistry education are multifaceted. Students often do not see the importance of chemistry education and may struggle with the subject matter. Failure can have a significant impact on student confidence in chemistry education, and it may be difficult for students to adjust after failing. Counseling and support can be critical for struggling students, and there may be differences in academic performance and confidence levels between urban and rural students.

Strategies for improving chemistry education include creating positive change in the subject, improving student understanding of chemistry, and developing innovative teaching methodologies. It is also essential to help students develop the ability to recover from setbacks and build their confidence through positive reinforcement. Additionally, it is crucial to address the differences in academic performance and confidence levels between urban and rural students to ensure that all students have equal opportunities to succeed in chemistry education.

CONCLUSIONS

In conclusion, chemistry education presents several challenges for both students and teachers. The theoretical nature of the subject, coupled with a lack of practical applications, can make it difficult for students to understand the subject matter. Additionally, students often perceive chemistry education as difficult, which adds to the challenges they face. Teachers play a crucial role in addressing these challenges by finding innovative ways to make the subject more accessible and engaging for students.

Students also face their own challenges in chemistry education, including the perceived lack of importance of the subject and the impact of failure on their confidence. Counseling and support can be critical for struggling students, and addressing differences in academic performance and confidence levels between urban and rural students is crucial to ensure equal opportunities for all students.

To improve chemistry education, it is important to develop innovative teaching methodologies, help students develop the ability to recover from setbacks, and build their confidence through positive reinforcement. Creating a positive change in the subject matter and improving student understanding of chemistry is also crucial. By addressing these challenges and implementing effective strategies, we can help students succeed in chemistry education and develop a deeper appreciation for the subject.

FUTURE DIRECTIONS/RECOMMENDATIONS

1) One major concern is the lack of studies on the relationship between resilience and self-efficacy in chemistry students specifically. While there is some research suggesting that resilience is associated with self-efficacy in general, there is a need for more targeted research to investigate the specific factors that contribute to the development of resilience and self-efficacy among chemistry students.

2) Another future direction is the limited understanding of the role of cultural and social factors in shaping resilience and self-efficacy among chemistry students in Pakistan. Pakistani students may face unique challenges and stressors related to their cultural and social background, and it is important to investigate how these factors may impact their ability to develop resilience and self-efficacy in the context of chemistry education.

3) There is a deficiency of research on effective strategies for developing resilience and self-efficacy among chemistry students in Pakistan. While some interventions, such as cognitive behavioural therapy and mindfulness training, have been shown to enhance resilience and self-efficacy in other contexts, there is a need to investigate their effectiveness in the specific context of chemistry education in Pakistan.

4) Finally, there is a need for more research on the long-term impact of resilience and self-efficacy on academic achievement and career success among chemistry students in Pakistan. While there is some evidence suggesting that
these qualities are associated with better academic outcomes, there is a need for longitudinal studies to investigate their impact over time and across different domains of life.

CREDIT AUTHOR STATEMENT

Muhammad Siddique: Conceptualization, Methodology, Software and write up
Dr. Khawaja Hisham Ul Hassan: Provide the guidance and supervise the research study
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COMPLIANCE WITH ETHICAL STANDARDS

It is declare that all authors don’t have any conflict of interest. It is also declare that this article does not contain any studies with human participants or animals performed by any of the authors. Furthermore, informed consent was obtained from all individual participants included in the study.

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