EMOTIONAL INTELLIGENCE AS CORRELATE OF CHEMISTRY EDUCATION UNDERGRADUATES' ACADEMIC ENGAGEMENT IN UNIVERSITIES IN SOUTH EAST NIGERIA

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Abstract

Emotions managed well prevents emotional outbursts. The skills of emotional intelligence are valuable in managing students' education and mental health. The study investigated the relationship between self-awareness, self-motivation, emotional intelligence and undergraduates' academic engagement in Chemistry education in south-east Nigeria. Correlation survey research design was adopted for the study. The population consists of 180 students. 60 students were sampled using purposive sampling technique. Chemistry Education Undergraduate Emotional Intelligence Scale (CEUEIS) and Chemistry Education Undergraduate Engagement Rating Scale (CEUERS) were used to collect data. The reliability coefficients of CEUEIS and CEUERS were 0.98 and 0.92, respectively, using Cronbach's alpha method. Regression analysis, analysis of variance, and t-value derived from Haye's process macro were utilized to analyze the data. Results showed that there is a moderate positive relationship between self-awareness, self-motivation, emotional intelligence and undergraduates' academic engagement in chemistry education. The amount of variation in Chemistry education undergraduates' academic engagement that is attributed to emotional intelligence, self-awareness and self-motivation is statistically significant. Chemistry education undergraduates' emotional intelligence, self-awareness and self-motivation determines their academic engagement. Thus, teachers need to relate to their students on an emotional level, support them to build high emotional stability, develop coping mechanisms to enable them manage stress, anxiety and other emotions that can affect their academic engagement and achievement.

Keywords: Academic engagement, Chemistry education, Emotional intelligence, Self-awareness, Self-motivation.

Introduction

Knowing something about Chemistry is worthwhile. The knowledge of Chemistry plays an important role in everyone's lives and provides an excellent basis for understanding the physical universe, we live in. With this priceless knowledge that man has so richly acquired, he can use it to reshape the world to his advantage. Thus, studying Chemistry is useful in preparing man for the real world. Chemistry education tackles today's global challenges by ensuring future environmental sustainability (Gomollon-Bel & Garcia-Martinez, 2022). One of the objectives of education is to train individuals to be emotionally intelligent, critical thinkers, and problem solvers. One of the main issues confronting Nigeria is the perception of poverty and wealth creation. The Educational Sustainable Development Goals (ESDG) 2030 strategy and the National Educational Plan both include national development goals to address this. The National Policy on Education (NPE) 2013 emphasizes the need for the development of a well-balanced individual with the necessary knowledge, skills, values, and attitudes for self-actualization and the socio-economic transformation of the country. The goal is pursued through the philosophy that guides the Nigerian education system. It implies that NPE lays a high priority on

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education relevant to the needs of the general Nigerian population as well as individual needs and aspirations.

Chemistry education at the tertiary level is more abstract, complex and stressful. Chemistry education undergraduate freshmen move about from one department to another daily in pursuance of their lectures, especially the borrowed courses. The distance covered is about 2 kilometers daily. All freshmen classes are large classes and full of distractions. These distractions affect their emotions. No emotion is wrong but the mode of expression may be inappropriate. Emotions affects intelligence. Failure to listen attentively to the lecturer, leads to disengagement in learning, resulting in too much work to be done to understand the courses taught. As a result, the freshmen experience increased cognitive load resulting in academic stress and become more incapable of adjusting to changes in their personal, social, and environmental contexts. They are also less able to deal with the current situation and make wise decisions regarding their learning. This makes them to be non-motivated, negative, and pessimistic. They are emotionally unstable.

A close observation of these freshmen academic activities shows that some of them disengage from learning activities, have reduced class attendance, fails to submit their assignment, not motivated to learn and even fail some courses. Secondly, the campus environment and lifestyle are new to these freshmen. Most of these freshmen just separated from their home and loved ones for the first time, thus not finding it easy to adapt. If these freshmen can recognize, understand, manage, and effectively use their emotions to guide their academic thinking they would have done better are will be referred to as being emotionally intelligent. Emotional intelligence brings emotional competence. Emotional intelligent people are attuned to their own thoughts and emotions, and they recognize how these feelings affect their interactions with others (Cherry, 2018). Students with increased level of emotional intelligence can better manage their academic objectives, attain academic success, and cultivate positive interpersonal relationships. There is need to help students developing emotional intelligence abilities, promote social and emotional learning, to improve learners' behavior and academic engagement (Mestre, & Barchard, 2017). Therefore, the researchers collected data to explore the relationship between emotional intelligence and students' academic engagement in Chemistry education.

Emotional intelligence (EI) has recently attracted much interest in academic literature. Abraham (1999) viewed it as understanding ones' emotion and those of others, and ability to use this information to achieve best outcome for all consent. Salovey and Mayer (2004) defined emotional intelligence as the capacity to recognize and categorize feelings and emotions in oneself and others, as well as to use this information to inform and direct one's thoughts and behavior. Emotional intelligence is the capacity of a person to motivate, regulate impulses, modify their mood, and remove distress from overpowering their thoughts, empathy, and hope (Corina, 2011; Duygulu et al., 2011; Mahmood et al., 2013). The individual's perceptions of their emotional intelligence, personality, and behavioral tendencies impact their capacity to cope with the demands and pressures of their surroundings. Goleman (1996) asserts that individuals who cultivate these emotional intelligence traits significantly increase their chances of success compared to those who do not. Importantly, emotional skills are not inbuilt but can be developed through learning. Moreover, these skills are interrelated, meaning that improving one skill can enhance others, leading to greater overall benefits. Emotional knowledge provides a foundation for personal growth and the development of stronger emotional intelligence skills, contributing to a more rewarding and successful life.

Emotional intelligence brings emotional competence. Emotional competencies are divided into personal and social competencies. Personal competencies concern our self-management, the ability to be aware of and regulate our emotions. Social competencies encompass understanding others' emotions (empathy) and managing our relationships effectively (social skills). A critical strategy for raising

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emotional intelligence among students is emphasizing the importance of teaching interconnected emotional, personal and social competencies, or skills that are useful in the real world. Emotional intelligent people are attuned to their own thoughts and emotions, and they recognize how these feelings affect their interactions with others. High EI individuals can identify and control their own and other people's emotions (Mestre, & Barchard, 2017). Developing emotional intelligence abilities can lead to success in the classroom. Thus, both teachers and learners should promote social and emotional learning in schools to improve learners' behavior and academic engagement. According to Goleman (1995), there are five key components of emotional intelligence, which are self-awareness, self-regulation, motivation, empathy, and social skills. Two different skills of self-awareness and self-motivation are examined in the study.

Self-awareness is students' consciousness about what they feel in learning and their attention about how to learn to understand some of the topics that are given by the teacher. Self-awareness is the capacity to identify ones' emotion, realize how our actions, moods, emotions affect others and monitor ones' emotional experience (Cherry, 2018). Self-awareness is knowing your strength, limitation, what one is feeling at any given time and understanding the impact those moods have on others. Operationally, self-awareness is the ability to recognize one's feelings, weaknesses, strengths, zeal, and core beliefs, as well as the degree to which these characteristics influence the decisions made by others. Self-awareness help students keep track of what they are doing (self-monitoring) and think over what happened to find ways to make things work better next time (Onyi & Aham, 2022).

Students awareness of their learning may help them to focus on various ways to catch up to the expected learning targets (Simal, et al., 2022). Students learning target includes; to meet up with their parental expectations, acquire knowledge and skills, cover the curricula and be hope in the family, society and nation (Skar, et al, 2021). Students lack of awareness manifests in the form of not focusing on the given task, not paying attention to the learning materials, not being active in the learning process, and not relearning the material taught (Hakelind, 2020). Students' awareness of their learning affects their academic engagement and achievement. According to Guo et al. (2020), the higher the self-awareness the higher the engagement and achievement (Brooman & Darwent, 2012; Kintu, et al., 2017). Undergraduates studying chemistry education must be aware of their emotions and how this affect them in and out of the classroom. Self-awareness instills self-motivation which stimulates students to complete their assignment.

Motivation is a psychological drive, that compels or reinforce an action towards a desired goal. Motivation is the reason behind peoples' behavior. Motivated behaviors are activity packed and goal oriented. Motivation correlates with learning (Amrai et al., 2011). The inner drive to accomplish a goal is known as self-motivation. Self-motivation is utilizing emotional factors to achieve goals, enjoy the learning process and persevere in the face of obstacles (Goleman, 1996). Operationally, self-motivation is the students' desire, willingness and persistence demonstrated during teaching and learning activities. It is an intrinsic motivation, driving one to meet personal needs, goals, carry out an activity for its innate satisfaction rather than for some discrete outcomes. It is not motivated by external rewards such as money, fame, and recognition. When intrinsically motivated, a person is moved to act for the fun or challenge entailed rather than because of outer prods, pressures, or rewards.

Self-motivation enhances cognitive, social, and physical development of the learner and growth in awareness and skills. Some people are intrinsically motivated for some academic activities. Such individuals are more likely to be committed, take initiative and search for ways to improve. Intrinsic motivation has been found to improve students' interest in challenges and learning. This therefore suggests that teachers should focus on increasing their students' intrinsic motivation (Jegede, 2015). In chemistry classes, students who are emotionally unstable lack focus and motivation. They are unlikely

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to pay attention in class or participate in activities. An enthusiastic, driven undergraduate in chemistry education attempts to solve problems and contributes significantly to the class. Therefore, self-motivation may influence the academic engagement of students. Finding the relationship between self-motivation and undergraduates' academic engagement in chemistry education is necessary. A student's psychological state of belonging, value judgment of education, and involvement in school, learning, studying, and extracurricular activities are all considered aspects of academic engagement.

Academic engagement includes behavioral engagement and psychological engagement. Academic engagement is defined as a multidimensional construct that captures how students are involved and motivated in learning activities and extracurricular activities, including attending class, turning in assignments, interacting with lecturers and other students, and participating in extracurricular activities (Salanova et al., 2010; Wang & Eccles, 2013). Their interest motivates them to persevere and be engaged in their learning. The authors view it as the level of involvement, interest and active participation students exhibit in their learning processes. To be deeply engaged academically, the students' needs to identify, be committed, participate actively and have interest in their learning goals, Academic engagement draws learners into intense thinking activities like analyzing, understanding concepts, rationalizing procedures and deducting meaning. It involves social interaction with peers and the teacher in form of exchanging experience, knowledge, opinions and support. Students who are academically engaged are actively committed to learning.

Moreover, when students are not academically engaged, they are distracted, passive, uninterested in learning, not committed to an academic goal, and show negative emotions in class. Student disengagement can pose a serious problem for educational institutions since it can lead to behavioral problems and even higher dropout rates (Schaufeli et al., 2002). Even though academic engagement is a critical component that improves students' overall success, it is still important to understand the factors that precede it. How students interact with one another during the learning process is referred to as academic engagement. It is necessary to address the low academic achievement and boredom that arise from a lack of academic engagement in the classroom. Given the detrimental effects of university students' lower academic engagement, it is critical to identify certain student characteristics that may shield them from these effects in a university setting. Thus, the study examines the relationship between emotional intelligence and undergraduates' academic engagement in Chemistry education   .

In light of the foregoing, the relationship between emotional intelligence and undergraduates' academic engagement in chemistry education was determined at the University of Nigeria Nsukka. Specifically, the study sought to i) ascertain the relationship between self-awareness and undergraduates' academic engagement in chemistry education ii) ascertain the relationship between self-motivation and undergraduates' academic engagement in chemistry education, iii) ascertain the joint relationship between emotional intelligence and undergraduates' academic engagement in chemistry education. To guide the investigation, the following null hypothesis was created: HO1: There is no significant relationship between self-awareness and students' academic engagement in Chemistry education. HO2: There is no significant relationship between self-motivation and students' academic engagement in Chemistry education. HO3: There is no significant relationship between emotional intelligence and undergraduate academic engagement in Chemistry education.

This study is significant because it provides insight into the currently existing theory of emotional intelligence by (Goleman, 1995). Goleman's Emotional Intelligence Theory proposes that individuals vary in their emotional competencies in self-awareness, self-regulation, motivation, empathy, and social skills which aren't fixed genetic traits but skills that can be developed and honed over time. on, empathy, and social skills which aren't fixed genetic traits but skills that can be developed and honed over time. Individuals who develop these emotional intelligence traits significantly increase their chances of

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success compared to those who do not. Honing emotional intelligence helps to understand ones' emotions, improves emotional abilities and acquire career success. Emotional intelligent people are attuned to their own thoughts and emotions, and they recognize how these feelings affect their interactions with others. Awareness of personal, parental, societal and educational goals enables one to accept and manage ones' emotion thereby increasing emotional intelligence level of the individual. Self-motivation stimulates interest, joy, emotional stabilities thereby increasing emotional intelligence level of the learner. Students with increased level of emotional intelligence are academically engaged and successful

Methodology

The current research was structured within the framework of a correlation survey research design. Nworgu (2015) noted that a purpose-driven subset of survey research is correlation survey research design, which aims to determine the relationship between two or more variables. This design was considered appropriate because the goal of the study was to determine how undergraduate students' academic engagements in Chemistry education is related to their emotional intelligence. The population of this study is 180 Chemistry education undergraduates from 100 to 400 level in 2022-2023 academic session. 60 Chemistry education freshmen were purposively sampled. These freshmen were chosen because they were experiencing the absence of home and academic stress (due to excessive movements involved in attending lectures). The Chemistry Education Undergraduate Emotional Intelligence Scale (CEUEIS) and Chemistry Education Undergraduate Academic Engagement Rating Scale (CEUAERS) were adapted and used to gather data. CEUAERS has 15 items, while CEUEIS has 50 items. CEUEIS and CEUAERS were built upon the emotional intelligence and student academic engagement models created by Goleman, respectively. Sections A and B make up its division. While Section B focused on the five emotional competency domains self-awareness and self-motivation, in particular Section A asked respondents about their demographics (Goleman, 1995).

Both instruments had a point-like rating scale used to rate responses as follows; Strongly Agree-4, Agree-3, Disagree-2, Strongly Disagree-1. A mean rating of 2.5 and above will be accepted while a mean rating of less than 2.5 will be rejected. The reliability indices of CEUEIS and CEUAERS were 0.89 and 0.92, respectively using the Cronbach Alpha method. Simple Linear Regression was used for the research questions and Analysis of Variance (ANOVA) (regression output) to test the hypotheses. Numerical data set were used for the study. The Regression analysis, ANOVA, and the t-value derived from Haye's process macro were utilized to analyze the data. The coefficient of determination (R^2) was used to determine the variation in Chemistry education undergraduates' academic engagement attributed to their emotional intelligence. To decide on results, the correlational coefficient (R) from 0 to 0.3 was considered low, 0.31 to 0.80 were considered moderate and 0.80 and above were considered as high (Nworgu, 2015).

Ethical Approval

The ethics committee of the institution granted ethical approval (Ref. No. FE/SE/VII/4326). Before the commencement of the study, the respondents were presented with informed consent form to fill and sign. The authors adhered to the ethical standard specification of the World Medical Association, 2013. The study was consistent with national and international standards for conducting research with human subjects.

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Results

From Table 1 above, the researchers found that the correlation coefficient(R)) of 0.574 was obtained. This indicate a moderate positive relationship between self-awareness and undergraduates' academic engagement in Chemistry education. The findings indicate that the R2 coefficient of determination is 0.329. This suggests that 32.9% of the differences in undergraduates' academic engagement in chemistry education is explained by their self-awareness while the remaining 67.1% could be attributed to other variables other than self-awareness.

Table 1: Regression analysis of the relationship between self-awareness and undergraduates' academic engagement in Chemistry education.

Model	N	R	R^2	Adjusted R^2
1	60	.574[a]	.329	.317

Table 2 shows that the F-ratio of 28.438 and the p-value of 0.00 are both below the significance level of 0.05. As a result, the null hypothesis was rejected. Therefore, the relationship between self-awareness and undergraduates ' academic engagement in Chemistry education is statistically significant

Table 2: Regression analysis of the relationship between self- awareness and undergraduates' academic engagement in Chemistry education.

ANOVA					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	43.340	1	43.340	28.438	.000[b]
Residual	88.303	58	1.524		
Total	131.733	59			

a. Academic Engagement is the dependent variable. b. Constant, self-awareness as predictors

From Table 3 above, the researchers found that the correlation coefficient(R)) of 0.322 was obtained. This indicate a moderate positive relationship between self-motivation and undergraduates' academic engagement in Chemistry education. Based on the findings, R2 has a coefficient of determination of 0.104. According to these findings, 10.4% of the variation in undergraduate academic engagement in chemistry education is explained by their self-motivation while the remaining 89.6% could be attributed to other variables other than self-motivation.

Table 3: Regression analysis of the relationship between self- motivation and undergraduates' academic engagement in Chemistry education.

Model	N	R	R^2	Adjusted R^2
1	60	.322[a]	.104	.088

Table 4 shows that the associated p-value of 0.012 and the F-ratio of 6.722 are less than the significance level of 0.05. Rejecting the null hypothesis follows. Thus, the relationship between self-motivation and undergraduates' academic engagement in Chemistry education is statistically significant.

Table 4 shows that the associated p-value of 0.012 and the F-ratio of 6.722 are less than the significance level of 0.05. Rejecting the null hypothesis follows. Thus, the relationship between self-motivation and

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undergraduates' academic engagement in Chemistry education is statistically significant.

Table 4: Regression analysis of the relationship between self- motivation and undergraduates' academic engagement in Chemistry education.

ANOVAª					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	13.681	1	13.681	6.722	.012[b]
Residual	118.052	58	2.035		
Total	131.733	59			

a. Academic Engagement is the dependent variable. b. Constant, self-awareness as predictors

The researchers discovered that the correlation coefficient (R) of 0.425 was obtained from Table 5 above. This suggests a moderate positive correlation between emotional intelligence and undergraduates' academic engagement in Chemistry education. The coefficient of determination (R^2) is 0.181 based on the findings. This implies that emotional intelligence accounts for 18.1% of the variation in undergraduates' academic engagement in Chemistry education. Not all of the remaining 82.9% can be accounted for by emotional intelligence.

Table 5: Regression analysis of the relationship between emotional intelligence and undergraduates' academic engagement in Chemistry education.

Model	N	R	R^2	Adjusted R^2
1	60	.425[a]	.181	.166

Table 6 shows that the F-ratio of 12.779 and the corresponding p-value of 0.001 are below the significance level of 0.05. Consequently, it is decided to reject the null hypothesis. Therefore, the relationship between emotional intelligence and undergraduates' academic engagement in Chemistry education is statistically significant.

Table 6: Regression analysis of the relationship between emotional intelligence and undergraduates' academic engagement in Chemistry education.

ANOVAª					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	23.784	1	23.784	12.779	.001[b]
Residual	107.950	58	1.861		
Total	131.733	59			

a. Academic Engagement is the dependent variable. b. Constant, self-awareness as predictors

Discussion

The study's findings were discussed under the following headings: self-awareness and academic engagement in chemistry education, self-motivation and academic engagement in chemistry education, and emotional intelligence and academic engagement in chemistry education. The study revealed a moderate positive relationship between self-awareness and undergraduates' academic engagement in Chemistry education. The study also revealed that the amount of variation of undergraduates' academic engagement in Chemistry education that is attributed to self-awareness is statistically significant. This indicated that self-awareness has moderate effect on undergraduates' academic engagement in Chemistry education. Therefore, there are other factors that can contribute to poor academic engagement of students other than self-awareness. The level of student's self-awareness could determine their academic

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engagement. This implies that self-awareness helps students to understand their strengths and weaknesses which can lead them to focus on their most academic opportunities. Self-aware students are more likely to be able to regulate their emotions and behaviors which can help them to stay focused and engaged in the classroom. Self-awareness helps students remember what they are doing (self-monitoring) and think over what happened to find ways to make things work better next time. For students dealing with current challenges, self-awareness is a crucial tool (Demink-Carthew et al, 2021: Gul, et al, 2021). Students' awareness of the learning may help them to focus on various ways to catch up to the expected learning targets (Simal, et al., 2022). This finding is in line with (Calvo, 2021) observation that students who have high levels of self-awareness also frequently demonstrate high levels of academic engagement. Teachers and parents should create awareness of their expectations from the students.

Based on the study' findings, there is a moderate positive relationship between self-motivation and undergraduates' academic engagement in Chemistry education. The study also revealed that the amount of variation of undergraduates' academic engagement in Chemistry education that is attributed to self-motivation is statistically significant. This indicated that self-motivation has moderate effect on undergraduates' academic engagement in Chemistry education. Therefore, there are other factors that can contribute to poor academic engagement of students other than self-motivation. It is clear that a student's level of self-motivation can determine their level of academic involvement. Self-motivated students are those who are driven to succeed and also take responsibility for their learning. They are more inclined to make plans, look for chances to learn, and persevere in the face of difficulties. Students who are self-motivated have higher levels of intrinsic motivation and academic engagement (in their studies) than students who lack self-motivation. Motivated students work hard in academics, unlike unmotivated students who will not have the inner strength to confront academic challenges, especially in Chemistry. Motivation plays a critical role in determining the learning of Science. This finding agrees with (Dweck, 2017) who showed the importance of self-motivation and how it can be developed in students. Students should be motivated in their learning activities to ensure they are academically engaged. Teachers and parents should inspire students for better academic engagement.

Another important finding discovered from our study is that there is a moderate positive relationship between emotional intelligence and undergraduates' academic engagement in Chemistry education. The study also revealed that the amount of variation of undergraduates' academic engagement in Chemistry education that is attributed to emotional intelligence is statistically significant. This indicated that emotional intelligence has moderate effect on undergraduates' academic engagement in Chemistry education. Therefore, there are other factors that can contribute to poor academic engagement of students order than emotional intelligence. This implies that students' academic engagement in Chemistry is influenced by their emotional intelligence. This study supports (Palmer, 2015) findings regarding the contribution of emotional intelligence to increased school engagement. Academically, students with high emotional intelligence perform better. Studies by Jatinder (2014), Marquez, Martin and Brackett (2006), Onyekwere, Ezeribe, & Unamba, (2019) and Prabha (2015) found significant correlation between EI and achievement scores in different fields. Lecturers should try to understand how students feel so that they can judge when emotion is interfering with or supporting their academic engagement in Chemistry. Parents and teachers in schools should expose students to situations that can challenge their emotional skills to enable them to learn how to use them effectively in life and at school.

Conclusions

Chemistry education undergraduates' academic engagement depends on their self-awareness, self-motivation and emotional intelligence. Therefore, Chemistry teachers should consider students' emotional intelligence in delivering the lesson so as to make sure that the classroom instructional objectives are achieved thereby increasing students' academic engagement. Students should be motivated in their learning activities to ensure that they are academically engaged. Teachers should make effort towards

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regulating students' activities by keeping them academically engaged, creating awareness of their expectations from students and motivate them for a better academic engagement. Parents and teachers in the schools should expose students to situations that can challenge their emotional skills to enable them learn how to use it effectively in life and at school. There should be training for preservice teachers and students while in school to equip them with the strategies to use to enhance self-awareness, self-motivation and emotional intelligence. Students self-awareness influence their self-motivation. In chemistry classes, students who are emotionally unstable are unlikely to pay attention in class, participate in activities, lack focus and motivation. Self-motivation has a positive influence on the academic engagement of students. Students must be aware that their emotion affect them in and out of the classroom.

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