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The Urban-Rural Divide: A Comparative Study of Organic Chemistry Self-efficacy And Academic Anxiety

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ABSTRACT

The landscape of science education is frequently bifurcated by geographical disparities that influences students' psychological readiness and academic achievement. This pilot study investigates the disparity between urban and rural secondary school students in the Saraikela- Kharsawan district of Jharkhand regarding their self-efficacy in Organic Chemistry and level of academic anxiety. The study utilizes descriptive-survey research design involving stratified sampling from senior secondary school students belonging to urban and rural educational settings. Data were collected by adopting stratified sampling technique from 200 students (100 urban, 100 rural) using the Organic Chemistry Self Efficacy Scale and Academic Anxiety Scale. Statistical analysis Mean, SD, t-tests and Correlation Coefficient were employed to measure the variance between two cohorts and to find relation between them respectively. Results of the study (t -test = 4.87) indicate a significant "urban advantage" in self-efficacy, likely bolstered by

greater access to specialized tutoring and laboratory resources, while academic anxiety ($t\text{-test} = 0.039$) of rural students reported higher which is not significant at $p < 0.01$ level. A negative correlation (-0.039) was found between organic chemistry self-efficacy and academic anxiety which indicates statistically significant, weak to moderate negative correlation exists between two variables that is higher the level of organic chemistry self-efficacy means lower academic anxiety. The findings of this pilot study may provide vital insights for policymakers and educators aiming to create a more inclusive and psychologically supportive environment for science education across all geographical boundaries.

Keywords: Science Education, Organic Chemistry, Self-Efficacy, Academic Anxiety, Urban-Rural Divide.

Introduction

Science education is essential for the growth of an individual, the base of which is laid at secondary level. Early exposure at secondary level to learn science develops interest and competence which are important factors for pursuing science related courses at higher level and to choose career in the field of science, technology, engineering and mathematics (Tie, 2006). Unfortunately, science is considered as a difficult subject for the most of secondary school students. The nature of science contents, poor teaching methods and learner's factors are the major sources of difficulties in learning science (Johnstone, 1991).

The Complex Nature of Organic Chemistry

Organic chemistry, study of hydrocarbons and their derivatives is full of abstract concepts which include IUPAC nomenclature, typical structures of the organic molecules, specific behavior of compounds because of presence of different functional groups, reactions and their mechanism, electronic movements during cleavage and formation of chemical bonds, electronic movement effects etc. Because of these complex contents, it is often perceived as the most daunting domain in chemistry. Learning of these complex concept lead to development of cognitive load and

misconceptions which are some of the important root causes of learning difficulties among the students (Cooper and Stowe, 2018).

The Role of Self-Efficacy and Academic Anxiety

Self-efficacy, a belief of one's ability to perform a specific task is a key determinant of motivation, persistence and performance, which is important for self-regulation, cognition and social context in learning and development (Bandura, 1986). Self-efficacy plays a central role in promoting motivation by influencing students' goal setting, persistence, effort and academic choices (Schunk and DiBenedetto, 2020).

Academic Anxiety, state of apprehension regarding performance, often leading to cognitive interference to the student during the performance of academic tasks. Science anxiety, a type of anxiety related to science learning, is a common problem among students which effects performance, self-efficacy and choice of science subjects as a major in higher studies and also negative beliefs about science with carrying patterns across different cultures (Mallow, 2006). Organic chemistry anxiety, anxiety of learning organic chemistry, and self-efficacy have negative correlation (Kurbanoglu, 2010).

The Urban-Rural Divide

The urban-rural schools of India have possess huge disparities. As per ASER report (2019), rural schools largely depend on government provision and face challenges like multi-grade classrooms, shortage of teachers, limited infrastructure, and poor facilities of digital access which impact the performance of the students and responsible for the poor academic achievement. In contrast, students of urban schools particularly run by private authorities perform better because of improved infrastructure, availability of subject-specific teachers, English-medium instructions and greater learning technology and other resources. Govind (2017) identified the challenges of education in rural Jharkhand. The schools situated in the rural Jharkhand were struggling with basic infrastructures like proper classrooms, toilets, regular supply of electricity and the poor resources like scarcity of textbook, laboratory and other learning materials. These schools also had shortage of qualified and specialist teachers.

Science education is an important aspect of secondary education. It provides a roadmap for future higher education and career. Organic chemistry, an important domain of

science education requires cognitive alertness of the learners. Urban regions having modern facilities provides learners to face the challenges of learning abstract concepts of organic chemistry but for rural students it increases the cognitive load specially in less developed region like Saraikela-Kharsawn which provides the opportunity to the researcher for conducting the present study.

Rationale for the Study

Saraikela-Kharsawn, a district of Jharkhand is well known for the medium and small industries. The industrial setup of this region provides a huge opportunities for the employment to the people having science background but unfortunately local people living in rural areas are not able achieve higher positions in these industries. The local people living in remote areas do not have sound knowledge of science and technology because of low socio-economic status and improper development of education specially science education.

The urban-rural divide present in the region creates a resource gap and widens the impact of two psychological constructs Self-Efficacy and Academic Anxiety within the students. By comparing the levels of organic chemistry self-efficacy and academic anxiety between the students of urban and rural areas, this study seeks to identify whether the rural disadvantage is primarily academic or psychological.

Statement of the Problem

THE URBAN-RURAL DIVIDE: A COMPARITIVE STUDY OF ORGANIC CHEMISTRY SELF-EFFICACY AND ACADEMIC ANXIETY

Objectives of the Study

- To compare mean scores of organic chemistry self-efficacy of senior secondary school students of urban and rural areas.
- To compare mean scores of academic anxiety of senior secondary school students of urban and rural areas.
- To determine the correlation between self-efficacy and academic anxiety of senior secondary school students in learning organic chemistry.

Hypothesis of the Study

Ho-1: There is no significant difference between mean scores of self-efficacy of senior secondary school students in learning organic chemistry.

Ho-2: There is no significant difference between mean scores of academic anxiety of senior secondary school students in learning organic chemistry.

Ho-3: There is no significant correlation between mean self-efficacy and academic anxiety of senior secondary school students in learning organic chemistry.

Significance of the Study

This study is highly significant as it addresses the unique educational disparities within urban and rural schools of Saraikela-Kharsawn within Jharkhand. By comparing urban centers like Adityapur and Saraikela with relatively less developed region, the research provides localized data on how geographic location influences STEM learning. Practically, it highlights the need for targeted resources allocation such as chemistry laboratories in rural schools and mental pressure of students due to urban coaching hubs. Ultimately, this paper serves as a vital framework for the Jharkhand Academic Council (JAC) and local educators to design inclusive teaching methodologies, bridging the gap and reducing academic anxiety for rural science learners.

Operational Definition of the Key Words

- **Science education:** Teaching organic chemistry to students through combination of theoretical knowledge, practical and modern technology.
- **Organic Chemistry:** Branch of chemistry which deals with the study of hydrocarbons and their derivatives and known for abstract contents.
- **Self-Efficacy:** Belief in learning and solving problems related to organic chemistry.
- **Academic Anxiety:** Fear related to learning organic chemistry and evaluation of tests or examinations.
- **Urban-Rural Divide:** Significant gap in term of infrastructures, availability of specialist teacher and learning environment.

Methodology**Research Design**

The study utilized descriptive-survey research design with stratified random sampling technique to access the effect of locality (Urban/Rural) on students' organic chemistry self-efficacy and academic anxiety of senior secondary school located in Saraikela-Kharsawan, Jharkhand. The objective was to compare the organic chemistry self-efficacy and academic anxiety of urban and rural students of the region and to investigate the role of urban and rural divide in the difference.

Population and Sample

The target population for this study consisted students studying chemistry in Saraikela-Kharsawan, Jharkhand. The focus was on students in grades 11 and 12, as these are the years in which direction of career is decided.

The sample for the study was collected from four schools running by government and private managements. Total students included in the study was 200 (100 Urban and 100 Rural).

Variables of the Study

The variables of the study are organic chemistry self-efficacy & academic anxiety (dependent variables) and urban-rural divide (independent variable).

Data Collection Tools

- **Organic Chemistry Self-Efficacy Scale:** Organic chemistry self-efficacy scale (OCSES-AG) used in the study to measure organic chemistry self-efficacy of the students was developed by Syed Tarique Anwar and Prof. Punita Govil in year 2022.
- **Academic Anxiety Scale:** Academic anxiety Scale (AAS-Samrua) is developed by Dr. Mohd. Abid Siddiqui and Dr. Atieq Ul Rehman in year 2017 for adolescents of age group 14 to 19 years.

Data analysis Techniques

The data collected by the researcher were analyzed using both descriptive and inferential statistics. Descriptive statistical technique including mean, standard deviation, frequency, and percentage were used to explain variation in organic chemistry self-efficacy and level of academic anxiety. Independent samples t-test were used to compare mean scores between the two groups and Correlation Coefficient was

used to state the correlation between organic chemistry self-efficacy and academic anxiety.

Analysis and Interpretation

Comparison of organic chemistry self-efficacy of students of urban and rural areas

The third objective was to compare mean scores of organic chemistry self-efficacy of senior secondary school students of urban and rural areas.

Table 1:

Area-wise M, SD, N, and t-values of organic chemistry self-efficacy of students

Area	M	SD	N	t-value	Remark
Urban	68.28	4.24	100	4.87	P < 0.01
Rural	55.26	9.81	100		

From table 1, it is evident that the t-value is 4.87 which is significant at 0.01 level with $df = 198$. Thus, null hypothesis that there is no significant difference between mean scores of self-efficacy of senior secondary school students in learning organic chemistry is rejected. **Comparison of academic anxiety of students of urban and rural areas**

The fourth objective was to compare mean scores of academic anxiety of senior secondary school students of urban and rural areas.

Table 2:

Area-wise M, SD, N, and t-values of organic chemistry self-efficacy of students

Area	M	SD	N	t-value	Remark
Urban	77.48	10.42	100	0.039	P < 0.01
Rural	80.12	10.63	100		

From table 2, it is evident that the t-value is 0.039 which is not significant at 0.01 level with $df = 198$. Thus, null hypothesis that there is no significant difference between mean scores of self-efficacy of senior secondary school students in learning organic chemistry not rejected. **Correlation between self-efficacy and academic anxiety**

The fifth objective was to find the correlation between organic chemistry self-efficacy and academic anxiety.

Table 3:

Correlation Coefficient between Self-Efficacy and Academic anxiety of students

Variable	Academic Anxiety	Remark
Self-Efficacy	-0.30	P < 0.01

From Table 3, it is evident that the correlation coefficient is -0.30 . Which is negative and highly statistically significant at 0.01 level with $df = 198$. It reflects that organic chemistry self-efficacy and academic anxiety were negatively and significantly correlated.

Conclusion

Results

- The level of organic chemistry self-efficacy of secondary school students of urban areas was more than their rural counterpart.
- The level of academic anxiety of secondary school students of urban area was less than their rural counterpart.
- The mean score of organic chemistry self-efficacy of senior secondary school students of urban areas was significantly higher than the students of rural areas.
- The mean score of academic anxiety of senior secondary school students of urban area was not significantly but less than their rural counterpart.
- The correlation between self-efficacy and academic anxiety among senior secondary school students was negative, statistically significant, and of weak to moderate level.

Conclusion

The study confirms a significant disparity in psychological approach to Organic Chemistry between urban and rural students in Sariakela-Kharsawan. The influencing factors like Lack of Resources, Low Socioeconomic Background, and Language Barrier are some of the causes. The urban students are better equipped to handle the cognitive load of the subject whereas rural students are hindered by high anxiety and low self-belief. Bridging this gap requires not just infrastructural parity, but a shift towards psychological informed pedagogy.

Recommendations

- **Contextualized Teaching:** Educators in Saraikela-Kharsawan should use “Green Chemistry” examples from the local environment to make Organic chemistry relatable.

- **Virtual Labs:** Implementing offline-accessible simulations for schools lacking chemical reagents.
- **Anxiety Reeducation Programs:** Peer-tutoring programs where high-efficacy students assist those with high anxiety.

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