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A STUDY ON CREATIVITY IN SENIOR SECONDARY LEVEL BIOLOGY STUDENTS

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Abstract: This study investigates creativity among senior secondary level biology students, focusing on gender and locale differences. Employing an experimental research approach, the study examines whether significant variations exist in creativity levels based on these factors. The sample comprises 90 students selected exclusively from Gangapur City. The findings reveal noteworthy disparities in creativity between male and female senior secondary level biology students, as well as between rural and urban counterparts. These results underscore the importance of understanding and addressing diversity in creativity styles among students, regardless of gender or locale. The study suggests implications for educational practices, emphasizing the need for inclusive teaching techniques that cater to diverse creativity generating styles. Furthermore, it highlights the importance of future research endeavors to delve deeper into the complexities of creativity in education, including the exploration of additional factors such as personality traits and socio-economic backgrounds. Overall, this study contributes valuable insights to the field of education, emphasizing the significance of promoting creativity as a fundamental aspect of student development and learning at the senior secondary level.

Keywords: Creativity, Senior Secondary School Students, Biology, Gender differences, t-test

Introduction

Education plays a vital role for the survival and progress of a society. The education system of society is in fact, its mirror in which every aspect of the society is reflected. Education is the process of acquiring skills, knowledge, attitudes, abilities, values, competences and the acceptable behavior of society to enable the individual live successfully and contribute meaningfully to the

development of the society [1]. As an individual in the society, he has to think critically about various issues in life and take decisions about them being free from bias and prejudices, superstitions and blind beliefs. Thus, he has to learn all these qualities of head, and heart through the process of education [2]. Education is the tool which can enable our students to solve academic and personal problems and challenges, to find new different and alternative solutions, and to have better tool, techniques, and resources to face the upcoming future challenges. Everybody has an interest in education because its education that is meant to take us into this future that we cannot even imagine [3]. Looking present scenario nobody has an idea inspite of all expertise that how the world will look like in the next few years.

Creativity can be referred to teaching-learning processes based on recognizing problems and discrepancies in accepted content, looking at things in a different way, making unexpected links among apparently discrepant elements of information, developing your own solutions to problems and similar processes [4]. Creativity in education is as important as literacy is and it should be treated equally. According to Piaget, the initial aim of education is not to train individuals who repeat the previous generations but to train inventors who have the skill of producing new things and who are creative [5]. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information [6].

Related Work

The enhancing creativity in biology education: A Review of Literature is comprehensive review explores various strategies for fostering creativity among senior secondary level biology students [7]. It discusses the effectiveness of inquiry-based learning, problem-solving approaches, and project-based learning in promoting creative thinking and problem-solving skills. Additionally, it examines the role of teacher support, classroom environment, and curriculum design in stimulating students' creativity in biology education [8].

This study on innovative approaches to promoting creativity in biology learning investigates innovative pedagogical approaches aimed at enhancing creativity among senior secondary level biology students [9]. It explores the use of technology-enhanced learning tools, such as virtual labs and educational games, to engage students in hands-on, experiential learning experiences. Additionally, it examines the integration of interdisciplinary activities and real-world applications to foster creativity and critical thinking in biology education [10].

The assessing creative thinking skills in biology education research focuses on developing and validating assessment tools to measure creative thinking skills among senior secondary level biology students [11]. It discusses the design and implementation of performance-based assessments, rubrics, and scoring criteria to evaluate students' ability to generate novel ideas, make connections, and solve complex problems in biology. Additionally, it explores the relationship between creative thinking skills and academic achievement in biology education [12].

Teacher practices and classroom strategies for cultivating creativity in biology education is qualitative study investigates effective teacher practices and classroom strategies for nurturing creativity among senior secondary level biology students [13]. It explores the use of open-ended questioning, collaborative learning activities, and inquiry-based investigations to stimulate students' curiosity, imagination, and creativity. Additionally, it examines the impact of teacher

professional development and instructional support on fostering a creative learning environment in biology classrooms.

This cross-cultural study examines cultural influences on perceptions of creativity and approaches to teaching and learning in biology education [14]. It explores how cultural values, beliefs, and educational practices shape students' attitudes towards creativity and their engagement in creative learning activities. Additionally, it investigates culturally relevant teaching strategies and curriculum adaptations to promote creativity and diversity in biology education [15].

Meaning of Creativity

Creativity is increasingly gaining importance in today's world. Creativity is fundamental to life. We are surrounded by representations of human creativity. Whatever is seen around us has originated through the imaginative powers of some individual or group of individuals. Creativity is a phenomenon whereby something new and valuable is created (such as an idea, joke, invention, solution, etc.) [2-3]. It can also be defined as something that is original and worthwhile. The most common definition in academic literature is the production of the novel idea that serves some purpose. Creativity serves a balance between originality and usefulness. Originality means to be a first, unique or uncommon idea and by usefulness, it means to be able to solve certain problem or difficulty or to be able to fulfill a certain desire or wish. Creativity is the process of developing original novel and yet appropriate response to a problem. An original response is one that is not usually given. A novel response is one that is new or has no precedent.

However, unless an original and novel solution is also appropriate, it cannot be termed as creative. An appropriate response is one that is deemed reasonable in the situation. Building a house of toothpicks is probably an original and novel idea, but is clearly not appropriate because such a house could be structurally weak [6]. The definitions of creativity have been started by different authors with emphasis on i.e. are more viewpoints one psychological, physical and intellectual.

Creativity is the ability to discover new solutions to problems or to produce new ideas, inventions or works of art. It is a special form of thinking, a way of viewing the world and interacting with it in a manner different from that of the general population. The importance of creativity has been felt so strongly as in the modern time. Along with the progress of human civilization, new and still newer problems are to be encountered in daily life, which directly challenge our creative ability in every walk of life Parker (1963) considers creativity as the art of seeking out, trying out and combining knowledge in a novel way which results in something new.

Creativity & Biology

Biology is a subject that is difficult to learn. The difficulty affects student achievement. In addition, the difficulty makes students less motivated to learn the subject. As a result, it is hard for them to achieve a good result of their studies.

The difficulty is caused by misconceptions, difficulty in finding relation between biology topics and the nature of the topic in general [8]. For example, students do not understand the structure of the chromosome in a cell nucleus and its role in genetic activities. It is hard for the student to learn it since they do not have the skill to learn the specific topics.

Learning biology is considered difficult, especially in some areas like cell division, genetics, and hormones. On the other hand, there is a connection between student successes in learning science with creativity. As creativity can be defined as the formation of new and useful ways to solve a problem, it can be used to help students to learn biology.

Creativity is important for students to learn in biology. As creativity is formulating novel and useful ideas, it can be applied in the education sector, to help student solve their own problem. Therefore, students need practice in the skills [12]. Learning activities need to include investigative activities, to allow students do inquiry while learning biology. It will foster students' creativity, as they are to solve their difficulties in learning biology. Those activities include developing idea, connecting different ideas, formulating suggestion for a certain problem, implementing solution into practical activities, treating unexpected result and evaluating result.

The creativity activities are applied in various learning activities, including classroom, online learning and laboratory practice [15]. The process of analogy, connecting different ideas and sequence of inquiry will help students to have an understanding of biological concepts. They can learn to clarify the misconception about some topics in biology by doing the sequence of inquiry, as they can receive feedback within the process. The process also helps them to learn the relation between biology topics through the analogy.

Need of the Study

Creativity refers to having inventive, productive and imaginative qualities. A creative person is able to link the existing information with new information in productive ways. Students who are creative may often be referred to as gifted or talented. Creative students, for example have a keenly observe a situation and have a desire to improve their abilities, produce variety of possible solutions to problem, are curious, original, comfortable with ambiguity, able to work independently, able to analyse and synthesize information, demonstrate compulsivity and an urgency to complete a task or execute an idea and have multiple latent abilities and characteristics of persistence. Thus, creative one plays with the existing knowledge and information and combines in a unique way that a creative product or idea is formed.

Today students are not frightened of being wrong or to fail. This does not mean that being wrong is being creative rather it means that when you are not ready to be wrong then you are not ready to accept challenges and failure and lastly not ready to try something new and come up with something original, different and useful. As one reaches the adulthood the ability to take a risk and be wrong is lost. The purpose of the education system is not to produce only doctors, engineers and university professors. Our education system is based on the idea of academic ability. If you top in academics, then you get the job of your choice. For many jobs, the first criteria are merit and not the aptitude or skill. This motivates the investigator to conduct A study on creativity in senior secondary level biology students.

Statement of the Problem

A study on creativity in senior secondary level biology students

Objectives of the Study

1. To compare the creativity in the male and female senior secondary level biology students.
2. To compare the creativity in the rural and urban senior secondary level biology students.

Hypotheses of the Study

1. There is no significant difference in creativity in the male and female senior secondary level biology students.
2. There is no significant difference in creativity in the rural and urban senior secondary level biology students.

Research Methodology

In the present study experimental method has been used. The sample for the present study comprises of 90 students selected from Gangapur City only.

Tool Used

In the present study the researcher used test of Creativity developed by Dr. Roma Pal.

Statistical Techniques

In the present study Means, SD and 't' test were used to ascertain the difference in mean scores of Creativity comparison groups.

Analysis and Interpretation of Data

Collected data through above mentioned inventories were analyzed in terms of mean, standard deviation and t-test method. The results have been presented in the tables.

Hypothesis-1

There is no significant difference in creativity in the male and female senior secondary level biology students.

Table 1: Mean, S.D. and 't' value of creativity of male and female secondary school students

Group	N	M	SD	t-value	Result
Male Students	45	38.20	9.28	5.60	Rejected
Female Students	45	47.10	5.24		

The table 1 presents the comparison of creativity scores between male and female secondary school students. The mean creativity score for male students is 38.20, with a standard deviation (SD) of 9.28, while the mean score for female students is 47.10, with a SD of 5.24.

The calculated t-value of 5.60 indicates a significant difference between the creativity scores of male and female students. This significance is confirmed by comparing the calculated t-value to the critical values at both the 0.05 and 0.01 levels of significance. Since the calculated t-value exceeds the critical values at both levels, the null hypothesis (stating no significant difference) is rejected.

The rejection of the null hypothesis implies that there is indeed a statistically significant difference in creativity between male and female secondary school students. Specifically, female students exhibit higher creativity scores compared to their male counterparts.

This finding suggests that there may be gender-related differences in how students express creativity, with females demonstrating a higher level of creativity in this particular context. Understanding these differences can inform educators and policymakers in designing interventions and educational strategies that cater to the specific needs and strengths of male and female students.

The figure 1 accompanying this analysis could visually represent the mean creativity scores of male and female students, possibly in the form of a bar chart or a box plot. This visual representation would further emphasize the observed difference in creativity between the two groups and provide a clear illustration of the statistical findings. Additionally, including error bars or confidence intervals in the figure would help convey the variability and uncertainty associated with the mean scores.

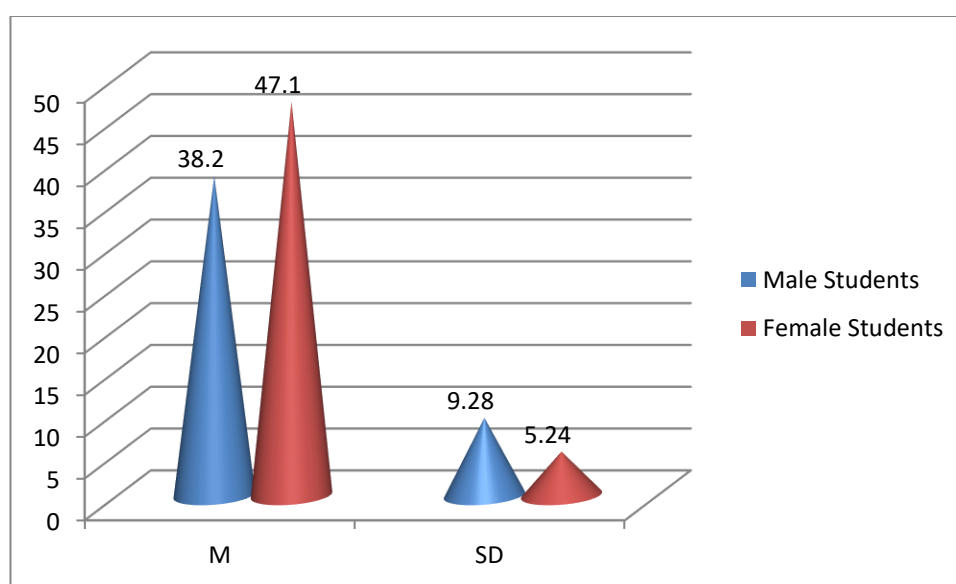


Figure 1: Mean & S.D. of creativity of male and female secondary school students

Hypothesis-2

There is no significant difference in creativity in the rural and urban senior secondary level biology students.

Table 2: Mean, S.D. and 't' value of creativity of rural and urban secondary school students

Group	N	M	SD	t-value	Result
Rural Students	45	37.25	7.05	3.30	Rejected
Urban Students	45	42.28	7.42		

Table 2 presents the comparison of creativity scores between rural and urban secondary school students. The mean creativity score for rural students is 37.25, with a standard deviation (SD) of 7.05, while the mean score for urban students is 42.28, with a SD of 7.42.

The calculated t-value of 3.30 indicates a significant difference between the creativity scores of rural and urban students. This significance is confirmed by comparing the calculated t-value to

the critical values at both the 0.05 and 0.01 levels of significance. Since the calculated t-value exceeds the critical values at both levels, the null hypothesis (stating no significant difference) is rejected.

The rejection of the null hypothesis implies that there is indeed a statistically significant difference in creativity between rural and urban secondary school students. Specifically, urban students demonstrate higher creativity scores compared to their rural counterparts.

This finding suggests that there may be environmental or contextual factors associated with urban living that positively influence creativity. These factors could include access to resources, exposure to diverse experiences, or cultural influences present in urban settings. Understanding these differences can inform educational policies and interventions aimed at promoting creativity in both rural and urban schools.

The figure 2 accompanying this analysis could visually represent the mean creativity scores of rural and urban students, possibly in the form of a bar chart or a box plot. This visual representation would further emphasize the observed difference in creativity between the two groups and provide a clear illustration of the statistical findings. Additionally, including error bars or confidence intervals in the figure would help convey the variability and uncertainty associated with the mean scores.

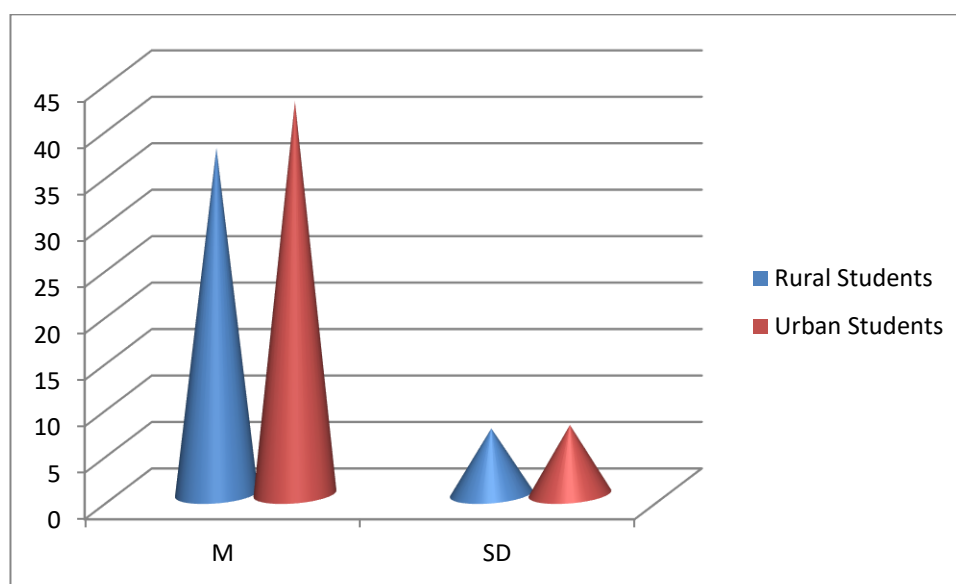


Figure 2: Mean & S.D. of creativity of rural and urban secondary school students

Findings

The following findings were drawn from the present study:

1. There was found significant difference in creativity in the male and female senior secondary level biology students.
2. There was found significant difference in creativity in the rural and urban senior secondary level biology students.

Educational Implications

Every research has some educational implications. The present study was designed to study the creativity among urban and rural and urban secondary school students. The findings showed there is significant difference in creativity of rural and urban secondary school students and also in male and female urban rural secondary school students. From this it may be said that teacher educators may make effort to use various teaching techniques matching all the four creativity generating styles irrespective of personality factors and background factors. The findings also provide the clue that other researchers should investigate this area of creativity styles thoroughly by selecting personality factors and background factors on different sample of teacher trainees.

Conclusion

The findings of this study reveal significant differences in creativity among senior secondary level biology students based on gender and urban-rural background. Male and female students, as well as urban and rural students, demonstrated varying levels of creativity. These results underscore the importance of considering diverse student characteristics and backgrounds when designing educational interventions aimed at fostering creativity. Teacher educators should strive to implement teaching techniques that accommodate different creativity generating styles, regardless of gender or urban-rural background. This approach can help ensure that all students have the opportunity to develop and express their creative potential effectively. Furthermore, these findings highlight the need for further research to explore the complexities of creativity styles in education. Future studies could investigate additional factors, such as personality traits and socio-economic backgrounds, to gain a deeper understanding of how these variables influence creativity among students. Overall, the findings of this study contribute valuable insights to the field of education and emphasize the importance of promoting creativity as an essential aspect of student development and learning. By acknowledging and addressing the diversity of creativity styles among students, educators can create more inclusive and effective learning environments that nurture creativity and innovation.

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