INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING & APPLIED SCIENCES
ISSN: 2322-0821(O)
ISSN: 2394-9910(P)
VOLUME 13 ISSUE 4
Oct 2025 - Dec 2025
www.irjeas.org

Research Article

Effect of Digital E-Content Formats on the Creativity of Undergraduate Learners.

Namita Nikam [1*]
[1*] Research Scholar PGT Biology, Raj Vedanta, Bhopal
namitakohade24@gamil.com

*Corresponding Author: namitakohade24@gmail.com

DOI–10.55083/irjeas.2025.v13i04020

Abstract: The rapid integration of digital technology in higher education has led to extensive use of e-content in teaching–learning processes. E-content is available in various formats such as text-based, multimedia, interactive, and gamified content, each offering different levels of learner engagement. In the present educational scenario, creativity is considered an essential learning outcome across academic disciplines. The present study aims to examine the influence of different types of e-content on the creativity of undergraduate students. A quantitative descriptive and comparative research design was adopted for the study. A sample of undergraduate students was selected using a convenience sampling technique. Creativity was measured using a standardised creativity assessment tool. Descriptive and inferential statistical techniques, including mean, standard deviation, and analysis of variance, were used for data analysis. The findings of the study revealed that there was no significant difference in the creativity of students exposed to different types of e-content. The results suggest that creativity is not significantly influenced by the type of e-content alone, but rather by pedagogical practices, learner engagement, and instructional design. The study highlights the need for educators to focus on meaningful learning experiences while integrating e-content to foster creativity in higher education.

Keywords: E-content, Creativity, Digital Learning, Undergraduate Students, Multimedia Learning, Interactive Learning, Higher Education

1. INTRODUCTION

1.1 Background of the study

The rapid advancement of digital technology has fundamentally transformed the landscape of education across the globe. Traditional classroom practices that once relied heavily on printed textbooks, face-to-face instruction, and fixed curricula have increasingly been supplemented, and in some cases replaced, by digitally mediated learning environments. This transformation has been accelerated by widespread internet access, mobile technologies, and the growing availability of digital learning resources. Educational institutions now rely extensively on electronic content, commonly referred to as e-content, to deliver instructional material, facilitate interaction, and support independent learning. As education systems strive to prepare learners for the demands of the knowledge-driven economy, attention has shifted toward higher-order cognitive skills such as creativity, critical thinking, and problem-solving. Creativity, in particular, is recognised as a vital competence for academic success, innovation, and lifelong learning. In this context, understanding how different types of e-content influence students' creativity has become an important area of empirical investigation.

1.2 Conceptual understanding of e-content in contemporary education

E-content refers to digitally delivered instructional materials that are designed to support learning through electronic devices such as computers, tablets, and smartphones. In contemporary education, e-content exists in multiple forms, including text-based modules, multimedia presentations, interactive simulations, and gamified learning environments. These forms differ not only in their mode of presentation but also in the degree of learner engagement and cognitive involvement they demand. While text-based e-content often emphasises reading and comprehension, multimedia and interactive content integrate visual, auditory, and kinaesthetic elements to create richer learning experiences. The increasing reliance on e-content has reshaped pedagogical practices by enabling self-paced learning, flexible access to resources, and opportunities for collaborative knowledge construction. However, the educational value of e-content cannot be assumed to be uniform across all formats. Its effectiveness largely depends on how learners interact with it and how it is integrated into instructional design. Therefore, examining e-content as a pedagogical tool requires attention to both its structural characteristics and its cognitive impact on learners.

1.3 Creativity as a learning outcome in higher education

Creativity is widely regarded as the ability to generate original, flexible, and meaningful ideas or solutions in response to a given problem or situation. In higher education, creativity is no longer confined to artistic disciplines but is increasingly viewed as a core academic outcome across fields such as science, technology, commerce, and social sciences. Universities are expected to cultivate learners who can adapt to complex challenges, think innovatively, and contribute novel perspectives within their professional domains. Creativity involves multiple dimensions, including fluency of ideas, originality, flexibility in thinking, and elaboration of concepts. These dimensions are shaped by both individual traits and environmental factors, including instructional methods and learning resources. With the growing use of digital learning tools, it has become necessary to examine whether e-content merely facilitates information acquisition or actively supports the development of creative thinking. Understanding creativity as an educational outcome requires empirical evidence that links learning environments to measurable creative performance rather than relying solely on theoretical assumptions.

1.4 Rationale and significance of the study

The integration of e-content into higher education has often been justified on the grounds of accessibility, efficiency, and learner engagement. While numerous studies have explored the impact of digital learning on academic achievement and student motivation, comparatively fewer investigations have focused on creativity as a primary outcome variable. Existing research frequently treats creativity as a secondary or indirect effect of digital instruction rather than examining it as a central construct. Moreover, the diversity of e-content formats raises important questions about whether certain types of digital materials are more conducive to creative development than others. The present study is significant because it seeks to empirically examine the influence of different types of e-content on students' creativity, rather than assuming a uniform effect of digital learning. By focusing on undergraduate students, the study addresses a population that is heavily exposed to e-content and simultaneously expected to develop innovative and independent thinking skills. The findings of this research are expected to contribute to evidence-based decision-making for educators, curriculum designers, and policymakers who aim to use digital resources in ways that genuinely enhance creative learning outcomes.

1.5 Statement of the problem

The problem addressed in the present study arises from the lack of clear empirical evidence regarding the influence of different types of e-content on students' creativity. Although e-content has become an integral component of higher education, its role in fostering creative thinking remains ambiguous. Some forms of e-content are assumed to enhance creativity by promoting interaction, exploration, and experimentation, while others may encourage passive consumption of information. The absence of consensus in existing findings creates uncertainty for educators regarding the selection and use of e-content in teaching-learning processes. Therefore, the problem of the study may be stated as: **"A study of the influence of type of e-content on students' creativity."**

1.6 Objectives of the study

The present study has been undertaken with the following objectives in mind: (i) to examine the level of creativity among undergraduate students exposed to different types of e-content, (ii) to compare students' creativity across selected e-content formats, (iii) to analyse whether the type of e-content has a significant influence on students' creative thinking, and (iv) to contribute empirical evidence to the field of digital pedagogy with reference to creativity as a learning outcome.

1.7 Research questions

The study seeks to answer the following research questions: (i) does exposure to different types of e-content lead to differences in students' creativity, (ii) are certain types of e-content more effective than others in fostering creative thinking among undergraduate students, and (iii) to what extent does the type of e-content influence overall creativity levels in higher education learners.

1.8 Hypotheses of the study

In order to test the objectives systematically, the following null hypotheses have been formulated: (i) there is no significant difference in the creativity of students exposed to different types of e-content, and (ii) the type of e-content does not have a significant influence on students' creativity.

1.9 Scope and delimitations of the study

The scope of the present study is confined to undergraduate students and focuses specifically on creativity as an outcome of exposure to selected types of e-content. The study is delimited by factors such as sample size, geographical location, and the specific e-content formats chosen for investigation. While the findings may provide valuable

insights into the relationship between e-content and creativity, they may not be directly generalisable to all educational contexts or learner populations. Despite these delimitations, the study offers a focused and systematic examination of an important issue in contemporary education.

2. THEORETICAL AND CONCEPTUAL FRAMEWORK

2.1 Conceptualisation of e-content types

E-content in educational contexts can be conceptualised as digitally mediated instructional material designed to facilitate learning through electronic platforms. The classification of e-content is not merely based on its technological form but on the level of cognitive engagement and learner interaction it promotes. Text-based e-content represents the most traditional form, closely resembling printed materials in digital format, where learning primarily involves reading, reflection, and comprehension. Multimedia e-content extends this approach by integrating text with images, audio, animations, and video, thereby appealing to multiple sensory channels and enhancing conceptual understanding. Interactive e-content introduces a higher degree of learner involvement by allowing students to manipulate variables, make choices, and receive immediate feedback, which can encourage exploration and active learning. Gamified e-content incorporates game elements such as challenges, rewards, and progression systems to motivate learners and sustain engagement. Each type of e-content embodies distinct pedagogical affordances, and these differences are expected to influence how learners process information, generate ideas, and engage in creative thinking.

2.2 Psychological and educational theories related to creativity

Creativity has been explained through several psychological and educational theories that emphasise both individual cognition and environmental influences. The theory of divergent thinking highlights creativity as the ability to generate multiple, varied, and original responses to open-ended problems. This perspective underscores the importance of learning environments that encourage exploration, flexibility, and risk-taking. Constructivist learning theory further supports the development of creativity by asserting that knowledge is actively constructed by learners through interaction with content and context. From this viewpoint, learning experiences that allow students to experiment, reflect, and collaborate are more likely to foster creative outcomes. Additionally, socio-cultural theories of creativity emphasise the role of social interaction, cultural tools, and mediated learning in shaping creative expression. Digital tools and e-content function as cultural artefacts that can either expand or constrain creative possibilities depending on how they are designed and used. These theoretical perspectives collectively suggest that creativity is not an isolated trait but a dynamic process influenced by instructional resources and learning environments.

2.3 Relationship between digital learning environments and creativity

Digital learning environments created through e-content offer unique conditions that can support creative development. Features such as non-linear navigation, multimodal representation, and immediate feedback provide learners with opportunities to explore ideas beyond rigid curricular boundaries. Interactive and multimedia-rich environments can stimulate curiosity and imagination by presenting information in diverse and engaging ways. At the same time, digital environments can facilitate collaboration and idea-sharing through online discussion platforms and shared workspaces, which are known to enhance creative thinking. However, the relationship between digital learning environments and creativity is not inherently positive. Over-structured or overly prescriptive e-content may limit opportunities for originality by directing learners toward predefined outcomes. Similarly, passive

consumption of digital materials may reduce cognitive engagement and restrict creative expression. Therefore, the influence of digital learning environments on creativity depends largely on the type of e-content used and the degree of autonomy and engagement it affords learners.

2.4 Conceptual framework of the present study

The conceptual framework of the present study is grounded in the assumption that the type of e-content functions as an independent variable that may influence students' creativity, which serves as the dependent variable. The framework recognises creativity as a multidimensional construct encompassing fluency, originality, flexibility, and elaboration of ideas. It is assumed that different e-content types vary in their capacity to stimulate these dimensions by offering varying levels of interactivity, sensory engagement, and learner control. The framework also acknowledges that creativity is shaped by a complex interaction of instructional and cognitive factors; however, the present study focuses specifically on isolating the influence of e-content type within a controlled academic setting. By situating e-content within established theories of creativity and learning, the framework provides a systematic basis for examining how digital instructional materials contribute to creative outcomes among undergraduate students.

3. REVIEW OF RELATED EMPIRICAL STUDIES

3.1 Empirical studies related to e-content and learning outcomes

Empirical research conducted over the past two decades has consistently highlighted the growing role of e-content in shaping learning outcomes in higher education. Several studies have demonstrated that digitally delivered instructional materials can enhance learner engagement, accessibility, and academic performance when appropriately designed and implemented. Research examining text-based and multimedia e-content has shown that digital formats enable flexible access to information and support self-paced learning, which can positively influence comprehension and retention. Studies comparing traditional instruction with e-content-supported learning environments have reported comparable, and in some cases improved, learning outcomes, particularly when digital materials are aligned with instructional objectives. However, empirical findings also indicate that the effectiveness of e-content is not uniform and depends on factors such as instructional design quality, learner readiness, and the nature of learner interaction with the content. These studies provide a foundational understanding of how e-content influences general learning outcomes but often stop short of examining higher-order cognitive skills such as creativity in a focused manner.

3.2 Empirical studies related to creativity in educational contexts

Creativity has been extensively studied within educational psychology as a key cognitive and affective outcome of learning. Empirical investigations have explored creativity across diverse academic disciplines, emphasising its role in problem-solving, innovation, and adaptive thinking. Research findings suggest that creativity flourishes in learning environments that encourage autonomy, open-ended inquiry, and active engagement. Classroom-based studies have demonstrated that instructional strategies such as project-based learning, inquiry-based instruction, and collaborative tasks significantly enhance students' creative thinking abilities. Quantitative studies using standardised creativity assessments have further revealed that creativity can be developed through structured educational interventions rather than being treated as an innate ability. Despite these insights, much of the empirical work on creativity has been conducted in traditional or blended learning settings, with limited focus on fully digital or e-content-driven environments. As a result, there remains a need to examine how creativity manifests

when learning is mediated predominantly through electronic content.

3.3 Studies linking digital instruction and creative thinking

A growing body of empirical research has attempted to bridge the gap between digital instruction and creativity by examining how specific digital tools and learning environments influence creative thinking. Studies focusing on multimedia learning environments have reported that the integration of visual and auditory elements can stimulate imagination and support the generation of original ideas. Interactive digital tools such as simulations, virtual laboratories, and digital storytelling platforms have been found to promote exploratory learning and divergent thinking by allowing learners to experiment with multiple solutions and perspectives. Research on gamified learning environments has indicated that game-based elements can enhance motivation and engagement, which are closely associated with creative performance. Similarly, studies on collaborative online platforms have shown that peer interaction and shared problem-solving can lead to enhanced creative outcomes through exposure to diverse viewpoints. While these studies suggest a positive relationship between digital instruction and creativity, many of them focus on isolated tools or specific instructional strategies rather than systematically comparing different types of e-content within a single research design.

3.4 Research gap and justification for the present study

Despite the increasing volume of research on digital learning and creativity, several gaps remain evident in the existing literature. Firstly, most empirical studies examine digital learning as a broad construct without differentiating clearly between types of e-content and their distinct cognitive implications. Secondly, creativity is often treated as a secondary outcome or discussed qualitatively rather than being measured systematically using standardised tools. Thirdly, there is limited empirical evidence from developing educational contexts where digital learning adoption has accelerated rapidly but unevenly. These gaps highlight the need for focused research that examines the influence of specific e-content types on creativity within a clearly defined learner population. The present study addresses these gaps by systematically comparing selected types of e-content and analysing their influence on students' creativity using empirical data. By doing so, it contributes to a more nuanced understanding of how digital instructional materials can be used not only to transmit knowledge but also to cultivate creative thinking in higher education.

4. RESEARCH METHODOLOGY

4.1 Research approach and design

The present study adopted a quantitative research approach with a descriptive and comparative research design to examine the influence of different types of e-content on students' creativity. A quantitative approach was considered appropriate as it enables objective measurement of creativity and facilitates statistical comparison across groups exposed to different forms of e-content. The descriptive aspect of the design helped in assessing the existing levels of creativity among undergraduate students, while the comparative component allowed for the examination of differences based on the type of e-content used. The research design was structured to ensure systematic data collection, analysis, and interpretation, thereby enhancing the reliability and validity of the findings.

4.2 Population of the study

The population of the present study comprised undergraduate students enrolled in degree colleges. This population was selected because undergraduate learners are extensively exposed to digital learning resources and are at a crucial stage of cognitive and creative development. The use of e-

content is particularly prominent at this level of education, making it an appropriate context for investigating its influence on creativity. The population was assumed to be sufficiently diverse in terms of academic disciplines, learning experiences, and exposure to digital tools.

4.3 Sample and sampling technique

A sample of undergraduate students was drawn from the identified population using a convenience sampling technique. Convenience sampling was employed due to practical constraints such as accessibility of participants and time limitations. Efforts were made to include students from different academic streams to ensure variability within the sample. Although convenience sampling may limit the generalisability of findings, it was considered suitable for the exploratory and comparative nature of the present study. The sample size was deemed adequate for conducting statistical analyses and drawing meaningful conclusions regarding the influence of e-content types on creativity.

4.4 Variables of the study

The study involved clearly defined independent and dependent variables. The independent variable was the type of e-content to which students were exposed, categorised into selected formats such as text-based, multimedia, interactive, and gamified e-content. The dependent variable was students' creativity, conceptualised as a multidimensional construct encompassing fluency, originality, flexibility, and elaboration of ideas. By isolating the type of e-content as the independent variable, the study aimed to examine its specific influence on creative thinking while keeping other conditions as consistent as possible.

4.5 Tools and instruments used for data collection

Data for the study were collected using a standardised creativity assessment tool designed to measure various dimensions of creative thinking. The tool included tasks that required students to generate multiple ideas, propose original responses, and elaborate on given stimuli. The selection of a standardised instrument ensured objectivity and consistency in measurement. In addition, a brief background information form was used to collect demographic details related to participants' academic background and exposure to digital learning resources. The tools were administered under controlled conditions to minimise external influences on participants' responses.

4.6 Procedure for data collection

The data collection procedure was carried out in a systematic manner. Participants were first informed about the purpose of the study and assured that their responses would be used solely for academic research. After obtaining informed consent, students were exposed to the selected types of e-content according to the research design. Following the exposure period, the creativity assessment tool was administered to measure participants' creative thinking. Clear instructions were provided to ensure that all participants understood the tasks and responded independently. The collected data were carefully recorded and organised for subsequent analysis.

4.7 Statistical techniques used for data analysis

The collected data were analysed using appropriate statistical techniques to test the formulated hypotheses. Descriptive statistics, including mean and standard deviation, were used to summarise creativity scores and understand overall trends within the sample. Inferential statistical techniques such as the t-test and analysis of variance were employed to examine differences in creativity across groups exposed to different types of e-content. These techniques enabled the researcher to determine whether observed differences were statistically significant and to draw valid conclusions regarding the influence of e-content types.

4.8 Ethical considerations

Ethical principles were strictly adhered to throughout the research process. Participation in the study was voluntary, and participants were informed of their right to withdraw at any stage without any negative consequences. Confidentiality of responses was maintained, and no personal identifying information was disclosed in the reporting of findings. The study ensured that participants were not subjected to any physical, psychological, or emotional harm. These ethical safeguards were implemented to uphold the integrity of the research and protect the rights of the participants.

5. DATA ANALYSIS AND INTERPRETATION

5.1 Organisation of data

The data collected from the undergraduate students were systematically organised and prepared for statistical analysis. Responses obtained from the creativity assessment tool were scored according to the prescribed guidelines of the instrument, ensuring uniformity in evaluation across all participants. The scores were then tabulated based on the type of e-content to which the students were exposed. This organisation of data facilitated clear comparison and accurate application of statistical techniques. Care was taken to verify the accuracy of data entry and to eliminate any inconsistencies before proceeding with analysis, thereby ensuring the reliability of the results.

5.2 Descriptive analysis of creativity scores

Descriptive statistical analysis was conducted to examine the overall distribution of creativity scores among the participants. Measures such as mean and standard deviation were used to understand central tendencies and variability in creative performance. The analysis revealed that students across all e-content categories demonstrated moderate to high levels of creativity, indicating that exposure to digital learning resources did not hinder creative thinking. While slight variations in mean scores were observed among different e-content groups, these differences were not substantial at the descriptive level. The variability in scores suggested individual differences in creative ability, reinforcing the notion that creativity is influenced by multiple factors beyond instructional materials alone.

5.3 Comparative analysis based on type of e-content

To examine whether creativity differed significantly across types of e-content, a comparative analysis was conducted. Students were grouped according to the e-content format they engaged with, and their creativity scores were compared across these groups. The analysis indicated marginal differences in mean creativity scores between students exposed to text-based, multimedia, interactive, and gamified e-content. However, no single e-content type consistently demonstrated a markedly higher influence on creativity compared to others. This finding suggests that while different e-content formats may offer varied learning experiences, their overall impact on creative thinking may be relatively similar when used within comparable instructional contexts.

5.4 Inferential analysis for testing hypotheses

Inferential statistical techniques were employed to test the null hypotheses formulated for the study. Analysis of variance was used to determine whether the observed differences in creativity scores across e-content types were statistically significant. The results of the analysis indicated that the differences in creativity scores were not significant at the accepted level of confidence. Consequently, the null hypothesis stating that there is no significant difference in the creativity of students exposed to different types of e-content was accepted. This outcome implies that the type of e-content alone does not exert a decisive influence on students' creativity.

Variable	Frequency	Percentage (%)
Gender		
- Male	48	48%
- Female	52	52%
Age Group		
- 18–20 years	62	62%
- 21–22 years	38	38%
Subject Group		
- Science	40	40%
- Arts	35	35%
- Commerce	25	25%
Type of E-Content Used		
- Text-Based	30	30%
- Multimedia	35	35%
- Interactive	20	20%
- Gamified Content	15	15%

5.5 Interpretation of findings

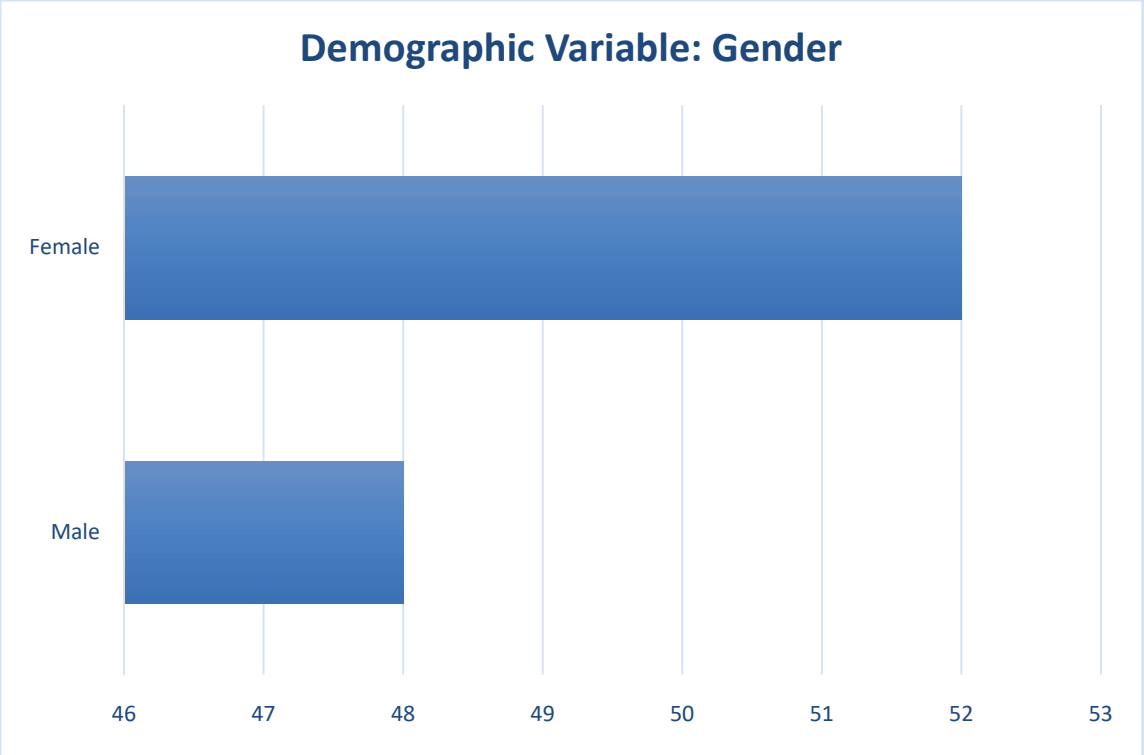
The findings of the data analysis suggest that creativity among undergraduate students is not significantly determined by the type of e-content used in instruction. Although digital learning environments provide diverse modes of content delivery, their influence on creative thinking appears to be mediated by other factors such as instructional strategies, learner motivation, and opportunities for active engagement. The absence of significant

differences across e-content types indicates that creativity may be more closely linked to how learning experiences are structured rather than the specific digital format employed. These results highlight the importance of pedagogical design and learner involvement in fostering creativity within digital learning environments.

6. DISCUSSION OF RESULTS

6.1 Discussion in relation to objectives

The primary objective of the present study was to examine the influence of different types of e-content on students' creativity. The analysis of data revealed that students exposed to various e-content formats demonstrated comparable levels of creative thinking. This finding suggests that the mere presence of digital instructional material, irrespective of its format, does not automatically result in significant differences in creativity. The objective of comparing creativity across different e-content types was achieved, and the results indicate that no particular format holds a clear advantage in fostering creativity. This outcome underscores the complexity of creativity as a cognitive construct that extends beyond instructional media and is shaped by a broader set of learning conditions



6.2 Discussion in relation to hypotheses

The hypotheses formulated for the study were tested using appropriate inferential statistical techniques. The results supported the acceptance of the null hypotheses, indicating that there was no significant difference in creativity among students exposed to different types of e-content. This finding aligns with the view that creativity is influenced by multiple interacting factors, including individual cognitive traits, motivation, and instructional design. While digital tools provide varied learning experiences, the absence of significant differences suggests that creativity cannot be attributed solely to the format of e-content. Instead, the way in which learners engage with content and the opportunities they receive for exploration and expression appear to play a more crucial role.

6.3 Discussion in the light of previous empirical findings

The findings of the present study are consistent with several empirical investigations that have emphasised the importance of pedagogical approaches over technological formats in fostering higher-order cognitive skills. Previous studies have reported that digital learning environments can support creativity when they encourage active participation, collaboration, and open-ended inquiry. However, these studies also caution against assuming that technology alone can enhance creative thinking. The results of the present study reinforce this perspective by demonstrating that different types of e-content, when used in similar instructional contexts, do not produce significantly different creative outcomes. This suggests that educators should focus on designing meaningful learning experiences that leverage e-content as a supportive tool rather than viewing it as the primary driver of creativity.

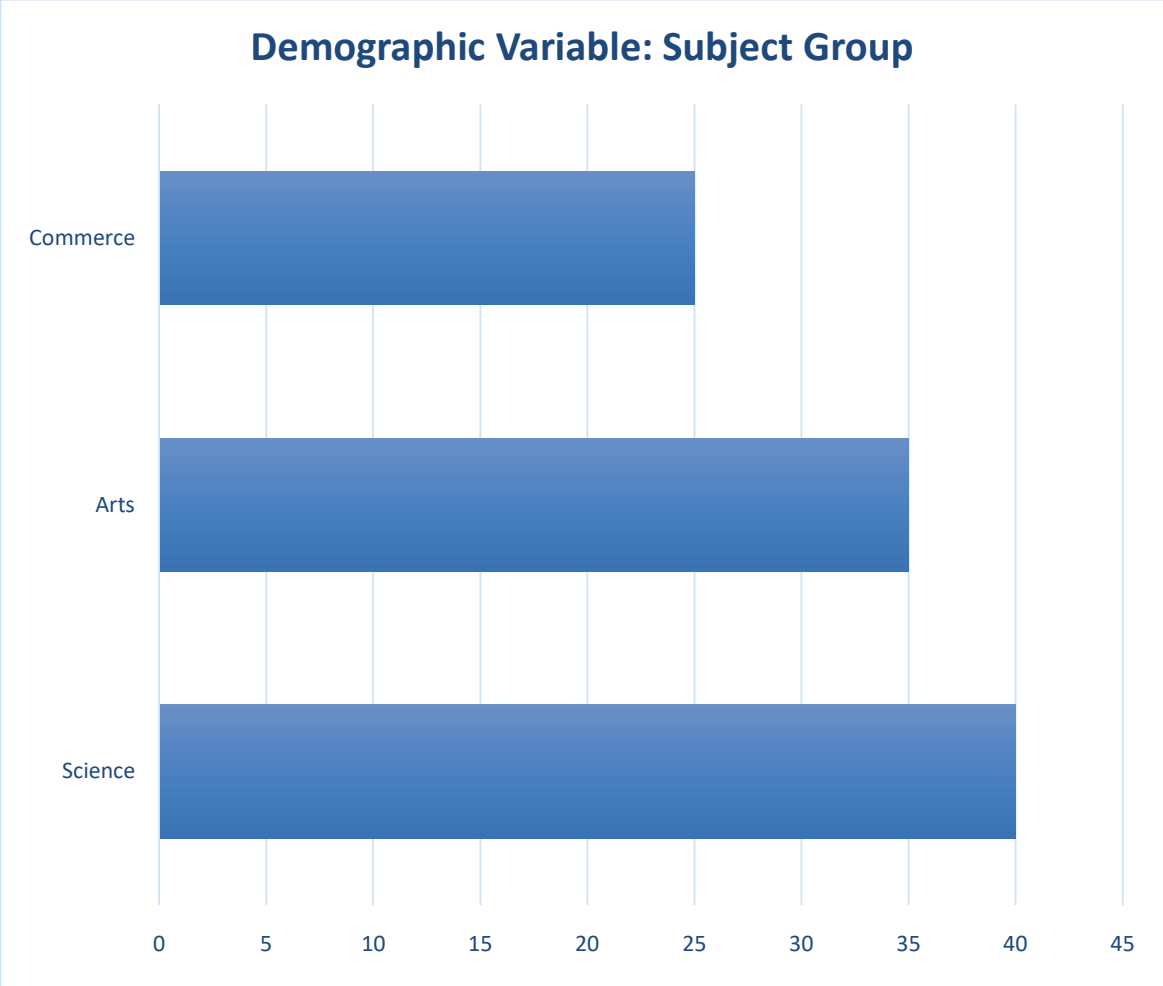
7. CONCLUSION AND EDUCATIONAL IMPLICATIONS

7.1 Major findings of the study

The present study investigated the influence of different types of e-content on the creativity of undergraduate students. The major findings indicate that students exposed to text-based, multimedia, interactive, and gamified e-content demonstrated similar levels of creative thinking. Statistical analysis revealed no significant differences in creativity scores across the various e-content formats, leading to the acceptance of the null hypotheses. These findings suggest that creativity is not significantly influenced by the type of e-content alone. Instead, creative thinking appears to be shaped by a combination of learner characteristics and instructional practices that extend beyond the digital format of content delivery.

7.2 Educational implications for teachers and institutions

The findings of this study have important implications for educators and educational institutions integrating e-content into teaching-learning processes. Since no specific e-content format was found to be superior in fostering creativity, teachers may select digital materials based on pedagogical suitability, accessibility, and learner needs rather than assuming inherent creative advantages of certain formats. Institutions should focus on training teachers to design learning activities that encourage exploration, reflection, and original thinking within digital environments. The emphasis should be placed on instructional strategies that promote active engagement and autonomy, as these factors are more likely to support creative development than the format of e-content alone.

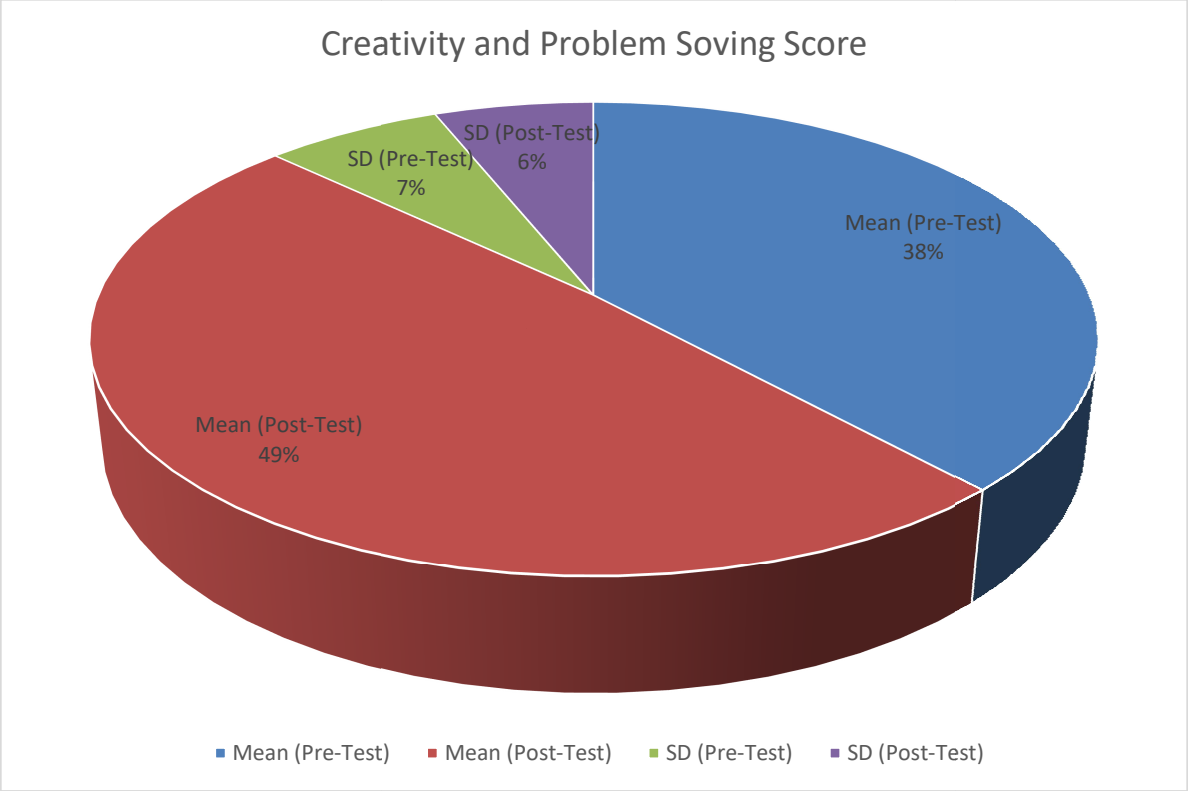


7.3 Limitations of the study

Despite its contributions, the present study has certain limitations that must be acknowledged. The use of a convenience sampling technique limits the generalisability of the findings to broader populations. The study was also confined to undergraduate students within a specific educational context, which may restrict the applicability of results to other levels of education. Additionally, creativity was measured using a standardised tool that may not capture all dimensions of creative expression. The duration of exposure to different types of e-content was limited, which may have influenced the extent to which creativity could develop and be observed.

7.4 Suggestions for further research

Future research may build upon the findings of this study by employing experimental or longitudinal research designs to examine changes in creativity over extended periods of exposure to e-content. Studies may also explore the combined influence of e-content type and instructional strategies on creative thinking. Investigating creativity across different academic disciplines and educational levels may provide deeper insights into contextual factors influencing creative development. Further research incorporating qualitative methods may also help to capture nuanced aspects of creativity that are not easily measured through quantitative tools alone.



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Cite this Article

Namita Nikam. Effect of Digital E-Content Formats on the Creativity of Undergraduate Learners. International Research Journal of Engineering & Applied Sciences (IRJEAS). 13(4), pp. 227-240, 2025. https://doi.org/10.55083/irjeas.2025.v13i04020