INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN(O): 2455-0620 [Impact Factor: 9.47]
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value : 86.87
Volume - 11, Issue - 05, May - 2025

DOIs:10.2015/IJIRMF/202505013 --:-- Research Paper / Article / Review

Evaluating the Impact of Interactive E-content in Extension Education: A Learner-Centered Study on Student Awareness, Digital Literacy, and Engagement

[1]Suchitra Singh, [2]Aarti Singh, [3]Sanghamitra Mohapatra
[1]Research Scholar, Ethelind College of Community Science, SHUATS, Prayagraj, Uttar Pradesh, India
[2]Assistant Professor, Ethelind College of Community Science, SHUATS, Prayagraj, Uttar Pradesh, India
[3]Professor, Ethelind College of Community Science, SHUATS, Prayagraj, Uttar Pradesh, India
Email - [1]suchitranarayansingh@gmail.com, [2]aarti.singh@shuats.edu.in, [3]sanghamitra.mohapatra@shuats.edu.in

Abstract: *The integration of digital technology into educational systems has become a transformative force, particularly in the context of Extension Education, where applied learning and field engagement are key. This study evaluates the impact of interactive E-content on undergraduate students in Extension Education, focusing on their awareness, digital literacy, understanding, perceived benefits, and challenges. With the shift toward learner-centered, flexible models driven by the New National Education Policy (NEP 2020), there is a growing emphasis on E-learning resources that support self-paced, accessible, and engaging education. Data were collected from 220 students across four universities using structured pre- and post-intervention questionnaires. The results reveal high levels of digital device access, familiarity with E-content, and a strong preference for its incorporation into the curriculum. However, significant gaps remain in training and exposure to advanced digital tools such as simulations and learning management systems. The findings support the development of interactive, inclusive, and user-friendly digital content to enhance learning outcomes in Extension Education, while also highlighting the need for teacher training and institutional support.*

Key Words: *Extension Education, Digital Literacy, Impact of Interactive E-content, Learner-Centered Study.*

1. INTRODUCTION:

The rapid advancements in digital technology have revolutionized education, enabling more interactive, engaging, and flexible learning experiences. Traditional chalk-and-talk methods, though effective, often lack the adaptability required to meet the diverse learning needs of students. In the field of Extension Education, which focuses on practical knowledge dissemination and field-based learning, integrating E-content and digital pedagogy can significantly enhance student engagement and learning outcomes. Digital pedagogy refers to the strategic use of technology in teaching and learning processes to improve comprehension, accessibility, and student participation. The integration of E-content—including multimedia, simulations, quizzes, and interactive modules—has proven to be highly effective in higher education, offering students self-paced learning opportunities and fostering a deeper understanding of complex concepts.

1.1 Importance of Digital Pedagogy in Extension Education

Extension Education primarily focuses on applied learning, skill development, and community-based knowledge transfer. Traditionally, it has relied on field visits, demonstrations, and practical training sessions. However, with the emergence of Industry 4.0 and digital transformation, there is a growing need to modernize teaching approaches in Extension Education (Nanjundaswamy et al., 2021). The COVID-19 pandemic further accelerated the demand for digital learning tools, making it evident that blended and fully online learning models are no longer optional but essential. Key benefits of digital pedagogy in Extension Education includes-

a. Increased accessibility to educational resources.
b. Enhanced engagement through interactive multimedia.
c. Flexibility in learning, enabling students to study at their own pace.
d. Data-driven insights for educators to assess student progress.
e. Scalability, allowing institutions to educate a larger audience effectively.

1.2 Challenges in Traditional Learning Methods

Despite the effectiveness of conventional teaching techniques, they come with several limitations. Traditional classroom methods often lack interactivity, making learning a passive process that results in low student engagement. Additionally, these methods offer limited flexibility, as fixed schedules make it difficult for students to revisit concepts at their own pace. Geographical constraints further add to the challenge, as field-based learning requires physical presence, which is not always feasible (Nurutdinova et al., 2016). Moreover, variations in teaching styles can lead to inconsistent learning experiences, impacting overall knowledge retention and comprehension. While digital learning has gained momentum, there is a lack of structured guidelines for designing and implementing effective E-content for Extension Education students. Current digital learning models often fail to address practical learning aspects, making it essential to develop a specialized framework that aligns with educational objectives, incorporates interactive and engaging elements, ensures usability and accessibility for all learners, and provides measurable learning outcomes.

This study aims to evaluate the impact of interactive E-content by conducting a questionnaire-based survey for undergraduate students in Extension Education courses and to evaluate the effectiveness of digital pedagogy in enhancing learning outcomes. It also identifies key challenges in E-content implementation and proposes solutions. The paper is organized as follows: Section 2 reviews the literature on digital pedagogy and E-content design, discussing existing models and their effectiveness. Section 3 explains the research methodology, including data collection techniques and analysis methods. Section 4 presents the findings and discussion, highlighting the impact of digital content on learning outcomes. Section 5 outlines key conclusions and recommendations for future research and practical implementation.

2. LITERATURE REVIEW:

In an effort to stop the spread of the COVID-19 epidemic, the majority of governments were obliged to temporarily close educational institutions. Millions of students have been impacted by local closures in a number of nations. More than 90% of learners worldwide have suffered as a result of these nationwide closures (UNESCO, 2020). Educational institutions worldwide are faced with the challenge of implementing alternate interventions to continue the teaching-learning process in the face of school closures, given the repercussions of extended delays in education. As a result, instructors must prepare lessons in order to instruct students virtually. Even while online instruction is not a brand-new approach for schools to give instruction, some teachers who are not tech-savvy may find it difficult to adapt (Sahu et al., 2020). As would be typical during the epidemic, online learning promises to produce transformative learning without the need for teacher prodding (Manning-Ouellette et al., 2017). Remarkably, 92% of the research concluded that online learning is just as successful as traditional learning, if not more so (Nguyen, 2015). Additionally, research revealed that most students had a favorable opinion of their individual online courses (Rodriguez et al., 2013; Kinsell and Tung, 2010; Walters et al., 2017). Face-to-face interaction has been the norm ever since communities adopted the idea of schools and courses to support education. By utilizing both material and instructional techniques, e-learning is described as "instruction delivered on a digital device (such as a desktop computer, laptop computer, tablet, or smartphone) that is intended to support learning" (Clark and Mayer, 2016). Learner-instructor, learner-learner, and learner-content interactions are the three categories into which interaction in e-learning is classified, and it is regarded as a crucial notion. Integrating online resources, activities, and communication tools into online courses can increase student satisfaction and retention in e-learning. Ineffective learning results from inadequate engagement in e-learning, which can cause online learners to lose interest or even quit out (Anderson, 2020).

The evolution of Extension Education has been shaped by its core principles, which have remained consistent over time. Harder (2010) highlights that community involvement, participatory approaches, and needs assessment are fundamental to its success. Needs assessment ensures that extension programs are customized to meet the specific requirements and challenges of the target audience. Similarly, Chang et al. (2014) emphasize that Extension Education, as a multidisciplinary field, extends knowledge beyond academic institutions, providing diverse populations with access to research findings, best practices, and relevant information. Its role in addressing societal issues, fostering lifelong learning, and promoting community engagement in higher education further underscores its significance.

3. METHODOLOGY:

3.1 Selection of respondents

A purposive sampling procedure has been used for the selection of the respondents. First-year and second-year students of B.Sc. Community Science has been selected purposively first. But because of COVID-19, fewer admissions took place during that period. To increase the number of students, the researcher had to enroll all undergraduate students from the first to the fourth year. A total of 220 respondents were selected from four selected Universities. For validation of the developed E-content, 05 experts were selected purposively.

The Table 1 reveals that most students in community science courses are females (92.3%) and males (7.7%). Most of the students belong to nuclear family types (65%) rather than joint families which is (35%) in total. The family size of the students varied between small, medium, and large whereas the majority belonged to medium size family five to eight members (39.5%), the next large families above eight members (31.8%), and the rest belonged to small families up to four members (28.6%). Looking at family monthly income revealed the number of students belonging to a middle-income group (54%) and lower income group (26.8%) whereas approximately (19%) of students belonged to the higher-income group (HIG). The majority (56.4 %) of the students had Home science in their stream of study or equivalent examination, whereas the rest (38.2%) of students had an art stream, and (5.5%) students had a science stream in their higher secondary examination or equivalent examination. One of the interesting findings of this experimental study is most of the (50.9%) students studied from Bihar School Examination Board and (36.8%) students from Uttar Pradesh State Board of High School and Intermediate Education, very few (12.3%) studied from Central Board of Secondary Education.

Table 1: Distribution of the Student Demographic Profile in Percentage (N=220).

Variable	Categorization	Frequency	Percentage (%)
Gender	Male	17	7.7%
	Female	203	92.3%
Family types	Nuclear	143	65%
	Joint	77	35%
Family Size	Small (up to 4 members)	63	28.6%
	Medium (5-8 members)	87	39.5%
	Large (Above 8 members)	70	31.8%
Family Monthly Income	Below Rs. 25,000 (LIG)	59	26.8%
	Rs.25,000 – 50,000 (MIG)	119	54%
	Above Rs 50,000 (HIG)	42	19%
Stream of Study	Art	84	38.2%
	Science	12	5.5%
	Home Science	124	56.4%
Educational Board	U. P. Board	81	36.8%
	C.B.S.E. Board	27	12.3%
	B.S.E. Board	112	50.9%

3.2 Tools and Techniques for data collection

Questionnaires have been used as instruments for data collection from the respondents. Keeping in view the objectives and the variables under the study, a well-structured interview questionnaire has been prepared and pre-tested to locate any ambiguity in the questions. After pre-testing certain modifications have been made to the questionnaire by consulting experts and finalized questionnaire were used for data collection. Questionnaires were chosen as the primary data collection tool due to their ability to gather standardized information from a relatively large sample efficiently. The questionnaires included combinations of Likert-type items, yes/no, and open-ended questions to assess participants' existing knowledge, perception, and attitude towards e-education and E-content. The Participants completed the questionnaires anonymously or using their e-mail ID online via Google Forms.

3.3 Questionnaire Development

The questionnaire was developed in simple language using simple coded questions and their relevant options. The questionnaires have been developed to evaluate the student's knowledge and behaviour towards E-content awareness, Understanding of E-content, Digital literacy, Benefits, and challenges, E-content in the classroom, Future of E-content, Bridging the digital divide, Based on the perception and attitude of learners about e-learning education. The student's response on different variables based on Skills and Facilities owned by respondent is shown in Table 2. Table 3 shows the student's response on different variables based on E-content awareness and Table 4 presents the distribution of the student's response on different variables based on understanding E-content. The distribution of the student's response on different variables based on benefits and challenges in e-learning is shown in Table 5.

Table 2: Student's response on different variables based on Skills and Facilities owned (N=220).

Sr. No.	Question to Respondents	Respondents' Answer	
		Yes	No
1.	Do you enjoy using the internet anywhere and at any time?	207 *(94%)*	13 *(5.9%)*
2.	Does your institution have Wi-Fi or internet access?	119 *(54%)*	101 *(45.9%)*
3.	Do you have a broadband, Wi-Fi, or internet network of your own?	206 *(93.6%)*	14 *(6.3%)*
4.	Is there a computer lab at your college?	187 *(85%)*	33 *(15%)*
5.	Have you used E-content for teaching or learning purposes before?	135 *(61.3%)*	85 *(38.6%)*
6.	Would you want E-contents, or online course materials, developed for your course?	211 *(95.9%)*	9 *(4%)*
7.	Is the designed online learning resources (E-contents) necessary for further education?	215 *(97.7%)*	5 *(2.5%)*
8.	Have you received training on using E-content effectively in an educational context?	21 *(9.5%)*	199 *(90.45%)*

Table 3: Student's response on different variables based on E-content awareness (N=220).

Variables	Response	
Q.1: How familiar are you with term 'E-content'?	**No. of Respondent**	**Percentage (%)**
a. Very Familiar	198	90%
b. Somewhat Familiar	13	5.9%
c. Not Familiar	9	4%
Q.2: What does 'E-content' typically refer to?		
a. Educational Content	27	12.2%
b. Electronic Content	182	82.7%
c. Entertainment Content	8	3.6%
d. Environmental Content	3	1.3%

Table 4: Distribution of the student's response on different variables based on understanding E-content (N=220).

Variables	Response	
	No. of Respondent	**Percentage (%)**
Q.1: What are some common types of E-content used in education? (Select all that apply).		
a. E-Books	127	57.7%
b. Online Videos	137	62.3%
c. Interactive Simulations	17	7.7%
d. Learning Management Systems (LMS)	0	0%
e. Educational Apps	45	20.4%
Q.2: How frequently do you use E-content in your educational activities?		
a. Daily	38	15.4%
b. Weekly	112	50.9%
c. Monthly	67	30.4%
d. Rarely	3	1.3%
Q.3: What devices do you typically use to access E-content? (Select all that apply).		
a. Desktop computer	156	70.9%
b. Laptop	149	67.7%
c. Tablet	83	37.7%
d. Smartphone	197	89.5%

e. E-Reader	43	19.5%
Q.4: What does "E-content" typically refer to?		
a. Educational Content	27	12.2%
b. Electronic Content	182	82.7%
c. Entertainment Content	8	3.6%
d. Environmental Content	3	1.3%

Table 5: Distribution of the student's response on different variables based on benefits and challenges in learning.

Variables	**Response**	
	No. of Respondent	**Percentage (%)**
Q.1: What is the primary benefit of using E-content in education?		
a. Reducing the cost of education.	67	30.4%
b. Enhancing accessibility and flexibility.	104	47.3%
c. Reducing the need for teachers.	31	14%
d. Slowing down the learning process.	18	8.1%
Q.2: What challenges can be associated with the use of E-content in education?		
a. Limited access to technology.	19	8.6%
b. Enhanced student engagement.	64	29%
c. Improved content quality.	84	38.1%
d. Reduced teacher workload.	53	24%

4. RESULT AND DISCUSSION :

The study found that the vast majority of students (94%) are comfortable using the internet anywhere and anytime, and 93.6% have personal access to internet networks such as broadband or Wi-Fi. However, only 54% of institutions provide free internet access, suggesting that infrastructure at the institutional level needs improvement. About 85% of students reported access to computer labs, and 61.3% had previously used E-content for learning, indicating moderate prior exposure to digital resources. A notable 95.9% of students expressed interest in integrating E-content into their curriculum, and 97.7% acknowledged its necessity for future learning—showing a strong student inclination toward digital learning tools. Yet, only 9.5% of the students had received any formal training in using E-content effectively, underlining a significant gap in digital literacy education.

In terms of awareness, 90% of students were very familiar with the term E-content. When asked about the nature of E-content, 82.7% correctly identified it as “electronic content.” However, 17.3% misunderstood or were unaware of its meaning, pointing to a need for introductory digital literacy modules. Regarding usage, online videos (62.3%) and e-books (57.7%) were the most frequently used types of content, while only 7.7% used interactive simulations, and none had experience with Learning Management Systems (LMS). Device usage patterns also indicated a high reliance on smartphones (89.5%) and desktop computers (70.9%) for accessing educational content, reflecting good digital accessibility but also a potential over-dependence on mobile formats.

Perceived benefits of E-content included enhanced flexibility and accessibility (47.3%) and reduced educational costs (30.4%). However, a small group (14%) mistakenly believed E-content reduces the need for teachers, and 8.1% viewed it as a hindrance to the learning process. Key challenges identified included content quality (38.1%), student engagement (29%), and reduced teacher involvement (24%). These findings suggest that while students are ready and willing to adopt E-content, there is a pressing need to build institutional capacity and provide formal training to both learners and educators to maximize its effectiveness.

5. CONCLUSION AND RECOMMENDATIONS

Conclusion: The study clearly demonstrates that undergraduate students in Extension Education are receptive to and largely supportive of the integration of E-content into their learning processes. Students have access to digital devices

and are familiar with general E-learning tools like videos and e-books. However, awareness and usage of advanced digital resources, such as simulations and LMS platforms, remain limited. Furthermore, a significant portion of students lacks training in how to effectively engage with E-content, which may hinder their ability to fully benefit from digital pedagogy.

Recommendations: By addressing following gaps and leveraging student receptiveness, educational institutions can significantly enhance the effectiveness of Extension Education through thoughtfully designed and well-implemented interactive E-content.

- *Develop Structured E-Content Training Modules:* Institutions should provide orientation and ongoing training for both students and faculty on how to effectively use E-content and associated platforms.
- *Improve Institutional Infrastructure:* Universities must enhance their digital infrastructure, including internet access and computer lab facilities, to ensure equitable access to E-learning resources.
- *Integrate Interactive Learning Tools:* Future content should include interactive simulations, quizzes, and assessments to increase student engagement and deepen understanding.
- *Promote Faculty Development:* Instructors should be trained to design and implement digital pedagogy, ensuring consistency and quality in online content delivery.
- *Evaluate and Update Content Regularly:* E-content should be reviewed periodically to maintain relevance, quality, and alignment with curriculum objectives.
- *Encourage Blended Learning Models:* Combining traditional methods with digital tools may bridge the gap for students who are still adapting to fully online learning environments.

REFERENCES:

1. Anderson, T., & Rivera Vargas, P. (2020). A critical look at educational technology from a distance education perspective, *Digital Education Review*, *37*, 208-229.
2. Chang, C. T., Hajiyev, J., & Su, C. R. (2017). Examining the students' behavioral intention to use e-learning in Azerbaijan? The general extended technology acceptance model for e-learning approach. *Computers & Education, 111*, 128-143.
3. Clark, R. C., & Mayer, R. E. (2016). E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning. *Hoboken*, NJ: John Wiley & Sons.
4. Harder, & Amy (2010). Determining Program Priorities: WC105. *EDIS*, *6*, 46-54.
5. Kinsell, C., Tung, C. K. (2010). Comparison of instructors' and students' perceptions of the effectiveness of online courses. *Quarterly Review of Distance Education 11*(785), 25–36.
6. Manning-Ouellette, A., & Black, K. M. (2017). Learning leadership: a qualitative study on the differences of student learning in online versus traditional courses in a leadership studies program. *Journal of Leadership Education, 16*(2), 59–78.
7. Nanjundaswamy, C., Baskaran, S., & Leela, M. H. (2021). Digital Pedagogy for Sustainable Learning. *Shanlax International Journal of Education, 9*(3), 179-185.
8. Nguyen, T. (2015). The effectiveness of online learning: Beyond no significant difference and future horizons, *MERLOT Journal of online learning and teaching*, *11*(2), 309-319.
9. Nurutdinova, A. R., Perchatkina, V. G., Zinatullina, L. M., Zubkova, G. I., & Galeeva, F. T. (2016). Innovative teaching practice: traditional and alternative methods (challenges and implications). *International journal of environmental and science education, 11*(10), 3807-3819.
10. Rodriguez, B. C. P., & Armellini, A. (2013). Interaction and effectiveness of corporate e-learning programmes. *Human Resource Development International 16*(4), 480–489.
11. Sahu, P. (2020). Closure of universities due to coronavirus disease 2019 (COVID-19): impact on education and mental health of students and academic staff. *Cureus 12*(4), e7541–e7549.
12. UNESCO (2020) COVID-19 educational disruption and response. UNESCO.
13. Walters, S., Grover, K. S., & Turner, R. C. (2017). Faculty perceptions related to teaching online: a starting point for designing faculty development initiatives. *Turkish Online Journal of Distance Education, 18*(4), 4-19.