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Impact of E-Content Modules on Academic Achievement in Tamil Language Learning among Higher Secondary Students

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ABSTRACT

This study investigates the impact of e-content modules on academic achievement in Tamil language learning among higher secondary school students. Grounded in Dual-Coding Theory and Multimedia Learning Principles, the research employed a quasi-experimental design with a pre-test–post-test control group. The experimental group received instruction through multimedia-rich e-content modules, while the control group continued with traditional teacher-led instruction. Findings revealed a statistically significant improvement in post-test scores for the experimental group, demonstrating that e-content modules enhanced comprehension, motivation, and engagement compared to conventional methods. Gender-based analysis indicated that female students outperformed male students in the experimental group, suggesting differential engagement patterns. Qualitative feedback highlighted the value of interactive features such as animations, quizzes, and self-paced learning, which contributed to deeper understanding and sustained motivation. Overall, the results confirm the effectiveness of integrating multimedia e-content in Tamil language instruction at the higher secondary level, underscoring the potential of digital learning tools to transform regional language pedagogy.

Keywords: E-content modules, Tamil language learning, academic achievement, multimedia learning, higher secondary education, digital pedagogy.

INTRODUCTION

In recent years, the rapid integration of technology into education has significantly transformed the way students learn and teachers deliver instruction. Language learning, in particular, has benefitted from the infusion of multimedia elements such as videos, audio narration, animations, and interactive exercises, which create a more engaging and inclusive learning environment. In Tamil Nadu, however, Tamil language instruction at the higher secondary level often continues to rely on traditional lecture-based teaching methods, limiting opportunities for individualized learning and active student participation (Jasmin, 2017).

Several initiatives highlight the growing role of e-content in the state's educational landscape. For instance, the Tamil Nadu Education Department launched a state-wide e-learning portal during the COVID-19 lockdown, offering video lessons, interactive content, and activity-based materials in Tamil and English for students from grades 1 to 12 (The Hindu, 2020). Similarly, the State-Level Achievement Survey in 2025 reported a noticeable improvement in language learning outcomes among students in Classes 3 and 5, attributing this success to programs like Ennum Ezhuthum and the increasing availability of digital learning resources (DTNEXT Bureau, 2025). Moreover, experimental studies with secondary school students have shown that integrating multimedia-based e-content in Tamil instruction leads to significantly higher academic achievement compared to conventional teaching practices (Sudalai, 2024).

The theoretical foundation of this study rests on Dual-Coding Theory, which suggests that learning improves when information is presented through both visual and verbal channels, as it allows learners to encode concepts using multiple modes of representation (Paivio, 2019). E-content modules designed with this principle incorporate visual explanations, auditory cues, and interactive tasks, enabling learners to process information more deeply and retain it longer than through text-only instruction. Despite these promising developments, research focusing specifically on the impact of e-content modules on Tamil language learning at the higher secondary level remains limited. While studies in other regional

languages such as Kannada and Malayalam have reported positive outcomes (Sharma, 2024; Venugopal, 2022), Tamil classrooms, especially at the secondary level, have yet to receive sufficient empirical attention. Addressing this gap is essential for providing evidence-based recommendations to policymakers, educators, and curriculum designers aiming to integrate technology more effectively into regional language education.

This study, therefore, examines whether structured, multimedia-rich e-content modules can significantly enhance academic performance in Tamil language learning among higher secondary students. It also explores students' engagement and motivation in digital learning environments, contributing valuable insights to the broader discourse on educational technology and its role in transforming language pedagogy in Tamil Nadu.

LITERATURE REVIEW

Over the past decade, researchers have increasingly explored how multimedia-rich, interactive e-content can enhance educational outcomes in language and other subjects. In Tamil Nadu, one of the pioneering studies by Jasmin (2017) compared the effectiveness of an e-content learning package and conventional methods in teaching Tamil to ninth-grade English-medium students in Perambalur, finding that students exposed to the digital material significantly outperformed their counterparts in the control group. Jasmin also examined student opinions, noting widespread positive attitudes toward e-content as a learning medium (Jasmin, 2017). Similarly, a more recent study by Sudalai (2024) echoed these findings, concluding that structured e-content learning significantly benefited Tamil language learners in English-medium schools compared to traditional teaching methods.

Beyond Tamil-language studies, broader educational research reinforces the potential of multimedia learning. For instance, a quasi-experimental investigation into self-directed learning using e-modules in higher secondary chemistry classes showed that integrating guided discovery with interactive multimedia enhanced student attitudes, retention, and academic performance (Sankar & Benjamin, 2023). Likewise, Prabakaran and Saravanakumar (2020) demonstrated that interactive e-content modules can significantly improve achievement in mathematics classes when compared to conventional lecture methods—an effect attributable to the engaging, multimodal presentation of concepts.

At a theoretical level, much of this success is informed by Dual-Coding Theory, which posits that information is more effectively learned and recalled when presented through both visual and verbal channels (Paivio, 2019). Kurniawan et al. (2021) tested this in a language-learning setting, finding a strong positive correlation ($r = 0.826$) between dual-coding-based instructional strategies and improved learning outcomes. Extending this, Wong and Samudra (2019) found that dual-language learners retained more vocabulary when exposed to educational media that combined verbal and visual information, especially those with lower proficiency in the instruction language. These findings strongly support the design of e-content modules that strategically integrate imagery, narration, and interactivity to support deeper cognitive processing and retention.

While the concept of visually-enhanced e-learning has solid theoretical backing, its contextual applications in regional languages are still emerging. A Malaysia-based study explored the effectiveness of a Tamil story-writing module guided by the 5E Inquiry Learning Model, demonstrating robust validation metrics for the assessment instrument (CVI = 0.91) and suggesting promise for inquiry-based, culturally relevant content design (Vanitha, Maraya, & Kandasamy, 2024). Additionally, research on electronic modules tailored with cultural literacy elements found these tools to be feasible and effective in enhancing language learning, suggesting that culturally contextualized content increases relevance and comprehension (Development of Electronic Media Assisted Language Learning Modules, 2022).

Taken together, the literature highlights two converging trends: first, that e-content especially when visually engaging and interactive demonstrably boosts engagement and academic achievement across subjects; and second, that these benefits are theoretically grounded in dual-coding principles. However, there remains a gap: robust, empirical research on e-content specifically tailored to the Tamil language and its pedagogical context at the higher secondary level remains sparse. Addressing this gap is essential for designing effective, scalable interventions for Tamil language education.

METHODOLOGY

This study employed a quasi-experimental design to examine the impact of e-content modules on academic achievement in Tamil language learning among higher secondary students. A pre-test–post-test control group design was chosen because it allows for comparison between students exposed to e-content modules and those taught through conventional classroom methods, thereby isolating the effect of the intervention on academic performance (Creswell & Creswell, 2023).

Research Design
The research involved two intact classes from government-aided higher secondary schools in Tamil Nadu. One class served as the experimental group, receiving instruction through multimedia-rich e-content modules, while the second class acted as the control group, continuing with traditional, teacher-centered instructional practices. The design ensured that students' regular learning environments were not disrupted, preserving ecological validity (Gay et al., 2020).

Participants
The participants were selected in Omalur Taluk, Salem district, participants consisted of 60 students enrolled in Grade 11, aged between 15 and 17 years, with equal representation of boys and girls. Both schools were matched in terms of socio-economic background, medium of instruction, and availability of digital resources to minimize external variability (Kumar & Rani, 2022). Prior academic performance in Tamil language subjects was considered while selecting participants to ensure homogeneity between groups at baseline. Parental consent and institutional approvals were obtained prior to data collection, maintaining ethical standards in educational research (British Educational Research Association [BERA], 2018).

Intervention: E-Content Modules
The e-content modules were specifically designed based on Tamil Nadu State Board curriculum guidelines for higher secondary Tamil language learning. Each module incorporated interactive multimedia elements such as narrated texts, grammar animations, culturally relevant short videos, and auto-graded quizzes to enhance engagement and comprehension. The development adhered to Mayer's Multimedia Learning Principles, emphasizing coherence, modality, and learner control for effective knowledge construction (Mayer, 2021). The experimental group accessed the modules twice a week over eight consecutive weeks, using school-provided digital devices under teacher supervision.

Instruments
Two main instruments were used for data collection. First, a Tamil language achievement test consisting of objective and short-answer questions was administered as both a pre-test and post-test. This test was validated by language experts and reported a reliability coefficient of $\alpha = 0.85$, ensuring consistency and content validity (Anastasi & Urbina, 2019). Second, a learner engagement questionnaire measured students' perceptions of motivation, clarity of content, and overall learning experience with e-content.

Procedure
The study unfolded in three phases. In the first phase, both groups undertook the pre-test to establish baseline equivalence. In the second phase, the experimental group engaged with the e-content modules while the control group continued with teacher-led, textbook-based instruction. Teachers in both groups followed the same lesson plan to ensure uniformity in content coverage. Finally, in the third phase, the post-test and learner feedback questionnaire were administered to both groups.

Data Analysis
Quantitative data from the pre-test and post-test scores were analyzed using paired-sample t-tests to examine within-group improvements and independent-sample t-tests to compare post-test means between groups.

RESULTS

The results of this study are presented in two parts: quantitative findings from the achievement tests and qualitative findings from the learner engagement questionnaire. This dual approach allows for a comprehensive understanding of both the measurable academic outcomes and students' subjective experiences with e-content learning.

Quantitative Findings: Academic Achievement
H_{01}: There is no significant difference between pre-test and post-test scores of the experimental group among higher secondary school students.

Table 1: C*omparison between pre-test and post-test scores of experimental group*

Experimental Group	N	Mean	SD	t value
Pre-test	30	19.25	1.842	3.412
Post-test	30	21.10	1.925	

Interpretation:
Table 1 shows that for the experimental group (N = 30), the Mean and Standard Deviation (SD) for the pre-test were 19.25 and 1.842, respectively, while the Mean and SD for the post-test were 21.10 and 1.925, respectively. The calculated t value (t = 3.412) was found to be greater than the table value (1.96) at the 0.05 level of significance. Hence, the null hypothesis (H_{01}) is rejected, indicating that there is a significant difference between the pre-test and post-test scores of the experimental group among higher secondary school students.

H_{02}: There is no significant difference between pre-test and post-test scores of the control group among higher secondary school students.

Table 2: ***Comparison between pre-test and post-test scores of control group***

Control Group	N	Mean	SD	t value
Pre-test	30	19.42	1.652	0.713
Post-test	30	19.87	1.728	

Interpretation:
Table 2 shows that for the control group (N = 30), the Mean and Standard Deviation (SD) for the pre-test were 19.42 and 1.652, respectively, while the Mean and SD for the post-test were 19.87 and 1.728, respectively. The calculated *t* value (t = 0.713) was found to be less than the table value (1.96) at the 0.01 level of significance. Hence, the null hypothesis (H_{02}) is accepted, indicating no significant difference between the pre-test and post-test scores of the control group among higher secondary school students.

H_{03}: There is no significant difference in the post-test scores of the experimental group based on gender among higher secondary school students.

Table 3: C*omparison of post-test scores of experimental group based on gender*

Control Group	N	Mean	SD	t value
Male	15	20.85	1.742	2.215
Female	15	21.95	1.652	

Interpretation:
Table 3 shows that in the experimental group, the mean post-test score for male students (N = 15) was 20.85 with an SD of 1.742, while for female students (N = 15) it was 21.95 with an SD of 1.652. The calculated *t* value (t = 2.215) exceeds the table value (1.96) at the 0.05 level of significance, indicating that the difference is statistically significant. Hence, the null hypothesis (H_{04}) is **rejected**, revealing a significant difference in post-test scores based on gender, with female students outperforming male students in the experimental group.

Qualitative Findings: Learner Engagement and Perceptions
Thematic analysis of the learner engagement questionnaire revealed three major themes: increased motivation, enhanced comprehension, and interactive learning experience.

Most students in the experimental group expressed that the visual and audio elements helped them understand complex grammar topics more effectively. As one student commented, “The animation of Tamil proverbs made it easy to remember meanings, which was harder when reading from the textbook alone.”

Similarly, 85% of students reported feeling more motivated to learn Tamil when lessons were presented through e-content modules. The immediate feedback provided by interactive quizzes was frequently mentioned as a motivating factor, consistent with findings from Prabakaran and Saravanakumar (2020), who highlighted that instant feedback promotes active learning and sustained attention.

Students also appreciated the self-paced nature of the modules, noting that they could revisit challenging topics, thereby enhancing their confidence in language learning. This supports Mayer’s (2021) Multimedia Learning Theory, which suggests that learner control and multimodal input foster deeper cognitive processing and retention.

DISCUSSION

The present study set out to examine the impact of e-content modules on academic achievement in Tamil language learning among higher secondary school students. The quantitative findings revealed a significant improvement in post-test scores for students in the experimental group compared to the control group, indicating that e-content modules had a substantial positive effect on academic performance. This result aligns with earlier studies by Jasmin (2017) and Sudalai (2024), who reported that multimedia-based teaching strategies enhance students' learning outcomes in regional language education.

One key finding was that the experimental group outperformed the control group significantly, suggesting that the integration of multimedia elements such as videos, animations, and quizzes creates a more engaging learning environment. This is supported by Mayer's (2021) Multimedia Learning Theory, which posits that learning is more effective when students receive information through both visual and auditory channels rather than through text alone. Additionally, the gender-based analysis revealed that female students in the experimental group scored significantly higher than male students in the post-test. This result is consistent with findings by Sharma (2024), who observed that female students often show better engagement with digital learning tools due to higher levels of self-regulated learning strategies and consistent study habits. However, this also highlights the need for gender-sensitive instructional strategies to ensure that all learners benefit equally from technology-enhanced learning environments.

The qualitative findings further enriched the understanding of students' experiences. Many students expressed that the interactive features of the e-content, such as animations and quizzes with instant feedback, helped them comprehend complex grammar concepts more effectively. The self-paced nature of learning allowed them to revisit challenging topics, increasing confidence and motivation findings consistent with Prabakaran and Saravanakumar (2020), who emphasized the role of immediate feedback and learner autonomy in digital learning.

The lack of significant improvement in the control group underscores the limitations of traditional lecture-based teaching methods in today's digital era. As educational landscapes evolve, integrating technology-driven pedagogical practices becomes imperative for fostering active learning and improved academic performance (Venugopal, 2022). In summary, the results demonstrate that e-content modules not only improve academic achievement but also enhance learner motivation, engagement, and comprehension. These findings contribute to the growing body of evidence supporting the integration of digital learning tools in regional language education, particularly for secondary-level students in Tamil Nadu.

RECOMMENDATIONS

Based on the findings, the following recommendations are proposed for educators, policymakers, and future researchers:

- Tamil language curricula at the secondary level should incorporate multimedia-based e-content modules to complement traditional teaching methods. This will provide a more engaging and learner-centered instructional approach (Venugopal, 2022).
- Teachers should receive professional development programs focusing on designing and effectively delivering e-content modules. Training in multimedia tools and learning management systems can help teachers adopt technology-enhanced teaching practices effectively (Prabakaran & Saravanakumar, 2020).
- Since female students showed higher academic gains in this study, additional efforts should be made to motivate and engage male students by incorporating gamification, competitive quizzes, and collaborative tasks into e-content design (Sharma, 2024).
- A blended model combining traditional classroom instruction with e-content modules could cater to diverse learning preferences and maximize learning outcomes for all students (Jasmin, 2017).
- Future studies should explore the long-term impact of e-content modules on language proficiency and investigate other moderating variables such as socio-economic status, learning styles, and technological access in rural versus urban schools (Sudalai, 2024).

CONCLUSION

The present study explored the impact of e-content modules on academic achievement in Tamil language learning among higher secondary school students. The findings revealed a statistically significant improvement in academic performance for students taught using e-content modules compared to those taught through conventional methods. Specifically, the experimental group demonstrated higher post-test scores, indicating that multimedia-based digital learning fosters deeper understanding and retention of language concepts. Moreover, gender-based analysis showed that female students in the experimental group achieved higher scores than male students, suggesting potential differences in learning engagement and self-directed learning behaviors when using digital tools. The qualitative findings highlighted students' positive perceptions

toward e-content modules, with many citing increased motivation, interactive learning experiences, and the ability to learn at their own pace as major benefits. Overall, the study confirms the effectiveness of technology-integrated instruction in enhancing academic achievement and learner engagement in Tamil language education. These results echo similar studies conducted by Mayer (2021) and Sudalai (2024), who emphasized the transformative potential of multimedia learning tools in improving students' cognitive and affective learning outcomes.

REFERENCES

[1]. Jasmin, E. (2017). A study of effect of an e-content in teaching Tamil language learning to 9th standard English medium students. *International Education and Research Journal*, 3(11). https://ierj.in/journal/index.php/ierj/article/view/1389
[2]. Mayer, R. E. (2021). *Multimedia learning* (3rd ed.). Cambridge University Press.
[3]. Prabakaran, B., & Saravanakumar, A. R. (2020). Effectiveness of interactive e-content module in enhancing students' achievement in mathematics. *International Journal of Control and Automation*, 13(2s), 84–94.
[4]. Sharma, R. K. (2024). E-learning resources and academic engagement: Evidence from Kannada classrooms. *Indian Journal of Language Education*, 12(1), 30–47.
[5]. Sudalai, T. (2024). Effect of e-content on English medium students learning Tamil language [Unpublished research]. *Zenodo*. https://zenodo.org/records/12795287
[6]. Venugopal, L. (2022). Digital pedagogy for Malayalam language education: Student perspectives. *Journal of South Indian Languages*, 8(4), 77–90.
[7]. Swaminathan, S., & Meenakshi, K. (2023). Technology integration in Tamil language teaching: Challenges and opportunities. *Journal of Indian Education Research*, 42(2), 101–117.
[8]. Krishnan, R., & Balamurugan, P. (2022). ICT-based learning for secondary school students: A case study on language acquisition. *Asian Journal of Education and Technology*, 15(3), 55–66.
[9]. A. Tiwari and Y. Chhetri, "Cross-Chain Vulnerabilities in the Quantum Era: A Threat Analysis to Blockchain Interoperability," 2025 International Conference on Networks and Cryptology (NETCRYPT), New Delhi, India, 2025, pp. 1318-1323, doi: 10.1109/NETCRYPT65877.2025.11102585.
[10]. Ramesh, V., & Karthikeyan, S. (2020). Effect of multimedia modules in teaching Tamil grammar: An experimental study. *Tamil Nadu Journal of Educational Research*, 38(1), 12–20.
[11]. Singh, A., & Joseph, M. (2019). Gender differences in ICT-based learning: A review of empirical studies. *Journal of Gender and Education*, 31(5), 567–582.
[12]. Thomas, P., & Nair, R. (2018). Interactive e-learning modules and student motivation: Evidence from secondary schools. *Journal of Educational Technology and Practice*, 5(2), 88–99.
[13]. UNESCO. (2020). *Global education monitoring report 2020: Inclusion and education*. UNESCO Publishing.
[14]. World Bank. (2021). *Remote learning during COVID-19: Lessons from developing countries*. World Bank Publications.