Designing and implementing a Tamil language learning tool for educational institutions

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ABSTRACT

Education supports both individual development and social progress. It is provided through various institutions worldwide, where learners gain knowledge, receive instruction, and participate in meaningful learning activities. Schools, colleges, polytechnics, teacher training institutes, and universities all contribute to intellectual growth and the development of essential skills. In today's technologically advanced environment, digital learning tools are important for supporting Tamil language instruction in modern classrooms. Learning languages across cultures plays a key role in connecting people globally. This study aims to design and implement a Tamil language learning tool for educational institutions and to evaluate its effectiveness based on user feedback. A descriptive research method was used, focusing on three states in Malaysia. Data were collected from 780 students across different educational institutions using a structured questionnaire. The findings show that most students preferred using the Tamil language learning tool in their learning process. They reported that it supports both independent learning and classroom instruction, with a user-friendly and easily navigable interface. The study emphasizes the importance of integrating digital tools into Tamil language learning environments in Malaysia. It also recommends expanding the tool's content, adding more interactive features to meet diverse learning needs, and promoting the use of digital language education tools to enhance effective and engaging learning.

1. Introduction

Education involves the transfer of information, skills, and discipline from instructors to learners. This process includes the transmission of knowledge that is important in all areas of society. Teaching and learning traditionally take place in classrooms, where teachers use textbooks and notes to guide instruction. Teachers apply various methods such as lectures, discussions, presentations, and role play to support student learning. To assess students' understanding, they use tests, assignments, assessments, quizzes, dictation, and other evaluation techniques. With advances in technology, current teaching methods have become more modernized. Digital technologies and the abundance of information have added a new dimension to education (Varghese and Mandal, 2020). The introduction of smart devices has brought significant changes across many fields, including education. One such change is the use of language learning tools in teaching. Educational institutions around the world have begun to integrate these tools into their systems. Malaysia is no exception. Tamil, one of the major languages used in Malaysia after Malay and Mandarin, is increasingly taught using digital tools. Tamil is taught in many schools, and both native speakers and non-Tamil learners, Malaysian and international, show interest in learning it for cultural, social, and professional purposes. Currently, there are more than 425 Tamil vernacular schools in Malaysia that use Tamil as a medium of instruction (Ibrahim, 2018). This article aims to design and implement a language learning tool for learners of Tamil. An educational institution is a formal organization established to provide structured teaching and learning. It includes a wide range of settings, from preschools to universities. Ahmed (2024) noted that educational institutions are the foundation of learning and information, offering a safe environment for learners to begin their

educational journeys. Within such institutions, learning tools are widely employed.

For effective teaching and learning, a variety of digital tools are utilized. Unlike traditional resources such as printed textbooks and exercise books, modern tools incorporate advanced features such as interactive lessons, personalized feedback, artificial intelligence, and gamification, all designed to enhance the learning experience. Technologies like artificial intelligence and augmented reality have been increasingly integrated into education, creating highly innovative, interactive, and engaging tools (Zulfiani et al., 2025). In Malaysia, various institutions—including schools, polytechnics, and universities—have adopted digital language learning tools for classroom use. Tamil language learning tools, in particular, have been implemented in educational institutions with Tamil-speaking environments. Examples include Adobe Animation, iThink, Karaoke, Puppet, Kavithai Punga, Tamil Grammar Checker, and Tamizha (Mahadevan et al., 2023). However, most of these tools were originally designed for Tamil learners in Tamil Nadu, India, where Tamil speakers form a large population.

Malaysia, by contrast, is a multilingual country where languages such as Malay, Mandarin (Chinese), Tamil, and Iban are widely used. The environment for learning Tamil in Malaysia is notably different from that of other regions. Therefore, Tamil language learning tools should be designed to meet the specific learning needs and contexts of Malaysian Tamil learners.

This study has two main objectives: (1) to propose the design of a user-friendly Tamil language learning tool for educational institutions, and (2) to evaluate the effectiveness of this tool through user feedback.

2. Literature review

Kumar and Kayalvizhi (2023) conducted a survey on the utilization of Tamil digital tools. The study aimed to assess the reliability of digital tool usage and analyze the level of utilization among college and university staff. A normative survey method with stratified random sampling was employed. A scale was developed to measure the level of utilization, and data were analyzed using percentages, t-test, and ANOVA. The findings indicated that staff members were satisfied with the use of digital tools, which were found to be highly reliable and valid. The overall level of utilization was above average, with no significant differences between college and university staff. The study recommended that staff adopt digital tools as an essential component of modern education and increase awareness of their effective use.

Ramalingam and Jiar (2023) studied the impact of a storytelling mobile application on Tamil students. The objectives were to examine the influence of the KaniMani Storytelling Mobile Application (KM-SMA) on speaking skills and to investigate learners' motivation to study Tamil through mobile applications. The sample consisted of 36 Tamil students aged 7 to 8 years. Pre- and post-tests confirmed that the mobile application had a positive impact on speaking skills, and most students reported higher motivation to learn Tamil through the app. The study concluded that mobile applications play a crucial role in language instruction and should be considered for inclusion in the Tamil language curriculum.

Gu (2025) carried out a study on the use of digital tools in English language learning among college students. The objective was to investigate the effectiveness of integrating memory and attention management technologies into English language teaching. Using an action research approach with descriptive and statistical analysis, data were collected from students over one academic semester who learned English with Quizlet and Busuu. Findings showed that the average sustained attention scores were 23.3 for the experimental group and 22.5 for the control group. Results highlighted the potential benefits of technology-based tools in improving language skills, attentional resource allocation, and working memory.

In addition to these, Tamil language teaching-related studies have been conducted. Selvamany (2022) examined Tamil language teaching, focusing on the development of Tamil learning, teaching strategies, and approaches such as thread review and insight. The study emphasized the personal and social benefits gained through learning Tamil and concluded that both teaching and learning are professional practices that can be enhanced with digital tools.

Earlier, Dhanalakshmi et al. (2010) designed and developed grammar teaching tools for Tamil using natural language processing applications. Adopting a qualitative research method, the researchers created computer-assisted tools to help students learn Tamil grammar more effectively. The tools included a Parts of Speech Tagger (PoST), a Chunker and Dependency Parser (CaDP) for sentence-level analysis, and a Morphological Analyzer for word-level analysis. These tools were particularly useful for second-language learners of Tamil, enabling them to understand word and sentence construction in a structured manner. A user interface was also developed for practical classroom use.

In summary, studies on Tamil language learning tools have focused on e-pedagogical technology, digital tool utilization, mobile applications, and grammar learning systems. While these initiatives provide valuable insights, existing resources do not adequately address the unique needs of modern Tamil learners in multilingual contexts such as Malaysia. This study seeks to fill this gap by designing and implementing a Tamil language learning tool specifically for educational institutions.

3. Methodology

This study is based on designing and implementing a Tamil language learning tool for

educational institutions. A descriptive research method was selected for the study. According to Siedlecki (2020), a descriptive study examines the characteristics of a population, identifies problems within a unit, organization, or population, and explores variations in characteristics or practices across institutions or even countries. To conduct the study, a structured questionnaire was developed as the primary research instrument. The questionnaire contained a set of items designed to collect information from respondents regarding the implementation of the Tamil language learning tool. It was used to gather data on both the advantages and the challenges associated with the tool's implementation. The study was limited to three states in Malaysia, namely Perak, Selangor, and Malacca. A total of 780 respondents, comprising students from various educational institutions, including universities and schools, participated in the research. Due to time constraints, the study could not be extended beyond these three states. Furthermore, as some institutions and students declined to provide consent, not all potential participants were included.

4. Results and discussion

As mentioned above, the present study was conducted with two main objectives: (1) to design a user-friendly Tamil language learning tool, and (2) to evaluate the effectiveness of the designed tool through user feedback. The design process of the language learning tool is described below.

4.1. Language tool design and implementation

Language technology tools offer an effective way to teach, share, preserve, and organize learning materials for under-resourced languages within communities (Matthews et al., 2025). The Tamil language learning tool developed in this study includes Tamil scripts, words, sentences, meanings, and conversations. The development process involved three main disciplines: linguistics, computer programming, and software design. With support from linguists, the researchers prepared Tamil scripts, words, and sentences. Tamil consists of 18 consonants and 12 vowels, which combine to form 247 distinct characters. Audio recordings of native Tamil speakers were collected to provide accurate pronunciation of each script. In addition, Tamil words were categorized grammatically (e.g., nouns and verbs) and defined with their conceptual meanings. At the syntactic level, the tool includes simple, compound, and complex sentences, along with their meanings and sample conversations.

All the linguistic content was integrated into the tool with the help of a computer programmer, after which a professional designer created the final user interface. A user manual was also prepared to guide educators and learners in using the tool effectively. The completed Tamil language tool was tested in a Tamil classroom. Feedback from teachers was collected, and any errors identified during the trial were corrected in the final version of the tool.

4.2. Results of the implementation

To evaluate the effectiveness of the designed Tamil language learning tool, the researchers used users' feedback. Dual code theory is utilized for this study. Dual code theory permits the students to use the information provided in dual channels or forms, such as verbal and visual (Kurniawan et al., 2022). It offers behaviour and experience of students, teachers, and educational professionals to understand and strengthen the educational phenomena and practices (Clark and Paivio, 1991). This study implements both verbal and visual forms. Verbal form includes language scripts, words, sentences, and symbols. Whereas, visual form includes pictures, visuals, and images. Through the dual code theory, students are able to comprehend text and its explanations through diagrams and pictures. The students feel at ease as the information on the Tamil language is incorporated in the language tool by two different channels, verbal and visual. It is very beneficial as the pronunciations of the scripts are recorded. They feel simple as the words, sentences, and their meanings are incorporated in the tool. As it is designed to look at with the combination of verbal and visual, it is student-friendly.

A total of 780 respondents were selected from various institutions, including universities and schools. Of these, 500 respondents were chosen from schools and 280 from universities. The random sampling method was applied to select both students and institutions. In addition, a structured questionnaire comprising four different elements related to the Tamil language learning tool was developed. These elements are: Demographic profile, advantages, issues, and outcomes of the learning tool. The questionnaire included a total of 20 items. All 780 respondents used the tool and provided feedback after using it. The element "Outcome of the Tamil Language Learning Tool" consisted of five open-ended questions based on user feedback, while the remaining three elements, with 15 items in total, were quantitatively analyzed. The results of the respondents are presented below.

4.2.1. Demographic profile

The demographic profile refers to the characteristics of individuals, such as age, gender, and years of experience (Llego et al., 2019). In this study, the demographic variables considered are age, gender, and level of Tamil proficiency, as shown in Figs. 1-3. Out of 780 respondents, 500 respondents belonged to the age group of 14 to 16 years old, and 280 were 19 to 22 years old. Regarding gender, 620 respondents were female, and 160 were male. This difference is due to the lower number of male students in the institutions where the data were collected.
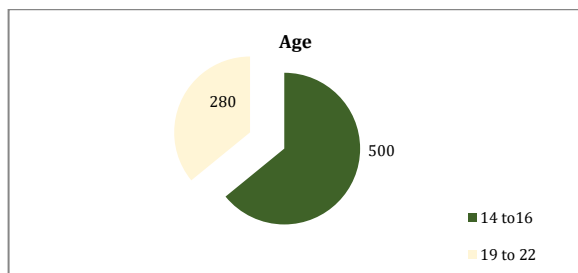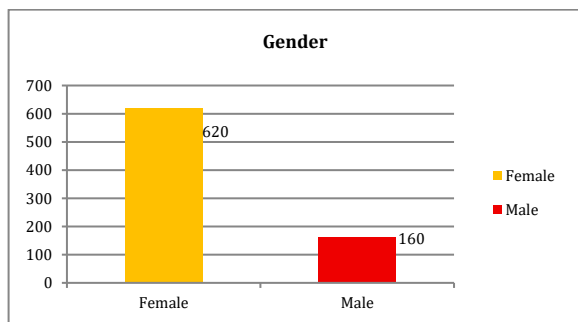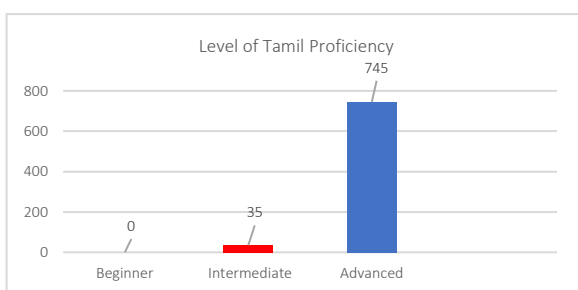
Fig. 1: Age

Fig. 2: Gender

Fig. 3: Level of Tamil proficiency

Tamil proficiency was categorized into three levels: beginner, intermediate, and advanced. Among the respondents, 745 were at the advanced level,

while only 35 were at the intermediate level. No respondents were recorded at the beginner level.

4.2.2. Advantages of the Tamil language learning tool

The advantages of the Tamil language learning tool were included as one element in the questionnaire. This element consisted of seven items. The responses of all 780 participants were collected, analyzed, and are presented in Table 1.

The responses were based on the seven items under the element Advantages of the Tamil Language Learning Tool included in the questionnaire. To assess these items, a Likert scale consisting of Strongly Agree, Agree, Satisfactory, Disagree, and Strongly Disagree was used. The Likert scale is a widely recognized measurement tool in social sciences research (Tanujaya et al., 2022). Since there were no responses under Strongly Disagree, this category is not presented in Table 1. In addition to the Likert scale, the results were analyzed using standard deviation (Std. Dev), mean, and variance for all the items.

More than 60% of the respondents selected Strongly Agree for Item 1 (The Tamil language learning tool improves my language skills effectively), Item 2 (The Tamil language learning tool makes learning more interesting and engaging), Item 5 (The Tamil language learning tool supports both self-learning and classroom use), Item 6 (The interface is user-friendly and easy to browse), and Item 7 (The Tamil language learning tool helps me to improve my listening, speaking, reading, and writing skills). The most notable finding is that 91.3% of respondents Strongly Agreed with Item 5.

Table 1: Advantages of the Tamil language learning tool

Item no.	Items	Strongly agree	Agree	Satisfactory	Disagree	Standard deviation	Mean	Variance, σ^2
1.	The Tamil language learning tool improves my language skills effectively.	66.7%	30.7%	2.6%	-	26.23	33.33	688.26
2.	The Tamil language learning tool makes learning more interesting and engaging.	79.7%	18.8%	1.5%	-	33.53	33.33	1124.81
3.	I can learn myself using the Tamil language learning tool.	27.8%	48.2%	24.0%	-	10.62	33.33	112.91
4.	The Tamil language learning tool provides immediate response on exercises and quizzes.	18.8%	32.4%	48.4%	0.4%	17.64	25.0	311.48
5.	The Tamil language learning tool supports both self-learning and classroom use.	91.3%	8.3%	0.4%	-	41.11	33.33	1690.46
6.	The interface is user-friendly and easy to browse.	83.7%	16.3%	-	-	33.7	50.00	1135.69
7.	The Tamil language learning tool helps me to improve my listening, speaking, reading, and writing skills.	74.0%	25.9%	0.1%	-	30.62	33.33	937.82

For Item 3 (I can learn independently using the Tamil language learning tool) and Item 4 (The Tamil language learning tool provides immediate responses on exercises and quizzes), 27% and 18.8% of respondents, respectively, selected Strongly Agree. Regarding the Agree category, Item 3 received the highest percentage (48.2%), while all other items received below 35%. Specifically, Item 1 received 30.7%, Item 2 received 18.8%, Item 4 received 32.4%, Item 5 received 8.3%, Item 6 received 16.3%, and Item 7 received 25.9%.

In the Satisfactory category, Item 4 received the highest proportion of responses at 48.4%, followed by Item 3 at 24.0%. In contrast, Item 7 recorded the lowest at only 0.1%. Other responses in this category were 2.6% for Item 1, 1.5% for Item 2, and 0.4% for Item 5. Finally, only 0.4% of respondents disagreed, and this was for Item 4.

Overall, these findings indicate that the majority of students strongly agree with the advantages of the Tamil language learning tool.

4.2.3. Issues in the Tamil language learning tool

The issues of the Tamil language learning tool were included as another element in the questionnaire. This element consisted of eight items. The responses from all 780 participants were calculated, and the corresponding percentages are presented in Table 2.

Table 2: Issues in the Tamil language learning tool

Item no.	Items	Strongly agree	Agree	Satisfactory	Disagree	Strongly disagree	Standard deviation	Mean	Variance, σ^2
1.	The Tamil language learning tool is difficult to use.	-	0.6%	5.9%	93.5%	-	42.59	33.33	1814.69
2.	The Tamil language learning tool takes time to open.	-	1.0%	33.5%	65.5%	-	26.33	33.33	693.38
3.	The content is not suitable for my proficiency level.	-	-	0.5%	80.3%	19.2%	34.07	33.33	1161.21
4.	Instructions and explanations provided in the Tamil language learning are unclear	-	16.2%	48.6%	30.5%	4.7%	16.40	25	269.18
5.	There is limited variety in the learning activities.	79.6%	8.4%	12.0%	-	-	32.74	33.33	1072.46
6.	The tool lacks interactive features	67.7%	2.5%	26.6%	3.2%	-	26.49	25	701.83
7.	The Tamil language learning tool does not cover all aspects of language learning with grammatical categories.	92.8%	7.2%	-	-	-	42.8	50	1831.84
8.	The images, audio, and videos used in the Tamil language learning are of low quality.	-	30.6%	41.5%	27.9%	-	5.87	33.33	34.56

The issues of the Tamil language learning tool were included as another element in the questionnaire. This element consisted of eight items. The responses from all 780 participants were calculated, and the corresponding percentages are presented in Table 2.

Table 2 presents the results for all items, showing the distribution of responses across the categories strongly agree, agree, satisfactory, disagree, and strongly disagree, together with their standard deviations, means, and variances. Table 2 includes statements such as "The Tamil language learning tool is difficult to use," "The Tamil language learning tool takes time to open," "The content is not suitable for my proficiency level," "Instructions and explanations provided in the tool are unclear," "There is limited variety in the learning activities," "The tool lacks interactive features," "The tool does not cover all aspects of language learning, including grammatical categories," and "The images, audio, and videos used in the tool are of low quality." More than 65% of respondents disagreed with the statements about the difficulty of use, slow execution, and unsuitability for proficiency level, indicating that users generally found the tool easy to use, functioning properly, and appropriate for their level.

In contrast, the highest proportions of strongly agree responses were recorded for the statements concerning the limited variety of learning activities, the lack of interactive features, and the inadequate coverage of language aspects, suggesting that these areas require improvement. Mixed responses were observed regarding the clarity of instructions and the quality of multimedia elements. For the statement on unclear instructions, most respondents selected satisfactory, followed by disagree. For the statement on multimedia quality, responses were distributed among agree, satisfactory, and disagree. Overall, these results show that the Tamil language learning tool performs well in several fundamental areas but still requires refinement in certain pedagogical and technical features.

Table 2 presents the results for the issues of the Tamil language learning tool, with responses measured on a five-point Likert scale (Strongly Agree, Agree, Satisfactory, Disagree, and Strongly Disagree) and further analyzed using standard deviation, mean, and variance.

The eight items included were as follows: Item 1– The Tamil language learning tool is difficult to use; Item 2–The Tamil language learning tool takes time to open; Item 3–The content is not suitable for my proficiency level; Item 4–Instructions and explanations provided in the Tamil language learning tool are unclear; Item 5–There is limited variety in the learning activities; Item 6–The tool lacks interactive features; Item 7–The Tamil language learning tool does not cover all aspects of language learning with grammatical categories; and Item 8 – The images, audio, and videos used in the Tamil language learning tool are of low quality.

More than 65% of respondents disagreed with Items 1, 2, and 3, indicating that the tool is generally easy to use, functions properly, and is suitable for the learners' proficiency levels. In contrast, the highest levels of "Strongly Agree" were recorded for Items 5, 6, and 7 (79.6%, 67.7%, and 92.8% respectively), suggesting that the tool has notable limitations in terms of variety in learning activities, interactive features, and coverage of all grammatical aspects.

Items 4 and 8 received mixed responses: for Item 4, 48.6% of respondents rated it as "Satisfactory" and 30.5% as "Disagree," while Item 8 received 30.6% "Agree," 41.5% "Satisfactory," and 27.9% "Disagree." Overall, the findings indicate that while the tool is user-friendly and suitable for learners, it still faces challenges related to content variety, interactivity, and comprehensive coverage of language learning components.

4.2.4. Outcome of the Tamil language learning tool

The outcome of the Tamil language learning tool was assessed based on five open-ended questions. The researchers received varied responses from the participants.

For the first question, "How is your experience in using the Tamil language learning tool?", twenty-three different responses were recorded. The most common remarks included: The tool is helpful for learning new words; it is useful for beginners like me; it improved my pronunciation; it has given me confidence to speak in Tamil; and I enjoyed learning Tamil vocabulary with more than one meaning.

For the second question, "What changes do you recommend in building words?", seventy-eight varied responses were received. Notable suggestions included: incorporating dialectical variations, including traditional vocabularies, adding literary terms, introducing words from classical Tamil literature, and distinguishing between spoken and written vocabularies.

The third question, "What is your comment about the design of the Tamil language learning tool?", elicited thirty-two different responses. Among them, the most frequent were: The design is satisfactory, and animated features are missing.

The fourth question, "What is your comment about the font and color of the Tamil language learning tool?", brought in three types of responses: the font and color are attractive; the font and color are beautiful; and the font size is smaller compared with other language tools.

For the final question, "To whom will you recommend the Tamil language learning tool?", thirteen different responses were noted. The most common were: I will recommend it to my teacher, and I will recommend it to my friends.

Overall, the responses were predominantly positive. These findings highlight the effectiveness of the Tamil language learning tool while also pointing out areas for further enhancement.

4.3. Discussion

The Tamil language learning tool was specifically designed for students of educational institutions, including both schools and colleges/universities. The tool was implemented in selected institutions, and students were asked to respond to the items in the questionnaire.

The results indicate that the Tamil language learning tool has several advantages when applied in educational settings. A majority of responses were positive, falling under 'Strongly Agree,' 'Agree,' and 'Satisfactory' categories regarding the benefits of using the tool. This aligns with existing research, which suggests that students enjoy integrating technology into their learning environments. For instance, Ponniah et al. (2023) observed that students are increasingly exposed to technology resources both at home and in their learning environments. The present study also affirms this view.

The tool in this study was designed with technological support, and the findings further highlight its effectiveness: 83.7% of the respondents provided positive feedback, with many 'Strongly Agreeing' that the tool is user-friendly and easy to navigate. This confirms the overall quality of the Tamil language learning tool. A related study on the quality of education suggests that teaching standards can be elevated to new heights through innovative approaches such as this (Anusia and Muniisvaran, 2023).

However, despite these positive outcomes, the study also identified certain limitations. The restricted range of Tamil language content, limited interactive sessions, and insufficient inclusion of Tamil grammatical aspects were among the issues noted. These challenges will be carefully reviewed and addressed in consultation with Tamil language experts.

In today's digital era, the use of technological tools and applications for learning is steadily increasing. Huang and Chen (2022) emphasized that modern individuals live in a digital age where they rely on a wide range of digital tools through mobile phones, computers, and smart home appliances. This further underscores the relevance and potential of adopting technology-driven tools in language learning.

5. Conclusion

The present study designed and implemented a Tamil language learning tool for students of educational institutions in Malaysia. A well-structured questionnaire, incorporating various elements, was used to collect data from the students. The findings of the study are based on their responses regarding the advantages and challenges of using the designed tool.

The results reveal that most students enjoy using the Tamil language learning tool in their learning environment, and it effectively supports both self-learning and classroom instruction. The tool's interface is user-friendly and easy to navigate. Furthermore, it enhances students' overall language proficiency by improving their listening, speaking, reading, and writing skills. Overall, the findings indicate that the designed Tamil language learning tool significantly contributes to learners' interest and engagement. The study underscores the importance of integrating digital tools into the Tamil learning environment in Malaysia. It recommends expanding the tool's content, incorporating more interactive features, and diversifying learning options to cater to varied learner needs. The use of language education tools is also encouraged to promote effective and enthusiastic learning. With further refinement and broader implementation, the tool could strengthen its impact and play a vital role in the preservation and promotion of the Tamil language in the digital age. In conclusion, the

responses confirm that the Tamil language learning tool is effective in enhancing students' content knowledge and language skills.

Compliance with ethical standards

Ethical considerations

The researchers obtained permission from school zone directors and the heads of the relevant university departments to collect data for the study through formal permission letters. Furthermore, the questionnaire was reviewed by a Tamil language expert from Sultan Idris Education University. Based on the expert's comments and suggestions, the questionnaire was revised and refined before being administered.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Ahmed N (2024). Educational institutions as social organizations: Structure, leadership, and societal impact. https://doi.org/10.5281/zenodo.14006484

Anusia K and Muniisvaran K (2023). Flipped classroom approaches in language teaching and learning in Malaysia: A meta-analytic review. International Journal of Academic Research in Progressive Education and Development, 12(3): 367-386. https://doi.org/10.6007/IJARPED/v12-i3/17860

Clark JM and Paivio A (1991). Dual coding theory and education. Educational Psychology Review, 3(3): 149-210. https://doi.org/10.1007/BF01320076

Dhanalakshmi V, Kumar MA, Rekha RU, Soman KP, and Rajendran S (2010). Grammar teaching tools for Tamil language. In the International Conference on Technology for Education, IEEE, Mumbai, India: 85-88. https://doi.org/10.1109/T4E.2010.5550056

Gu J (2025). Digital tools in language learning: Optimizing memory and attention for college students. International Journal of Human–Computer Interaction, 41(12): 7652-7662. https://doi.org/10.1080/10447318.2024.2400384

Huang YT and Chen CH (2022). Design interactive teaching tools of programming language for senior high school students. Training, Education, and Learning Sciences, 59: 48–55. https://doi.org/10.54941/ahfe1002383

Ibrahim N (2018). A case on Tamil education in Malaysia: Is Tamil education being sidelined? SHS Web of Conferences, 53: 03006. https://doi.org/10.1051/shsconf/20185303006

Kumar CA and Kayalvizhi R (2023). Utilization of digital tools: Critical analysis of college and university professors in Tamilnadu. Asian Journal of Education and Social Studies, 45(4): 29-35. https://doi.org/10.9734/ajess/2023/v45i4990

Kurniawan C, Kusumaningrum SR, Lam KFT, and Surahman E (2022). Improving language teaching and learning process with dual coding theory approaches. Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan, 7(8): 281-289. https://doi.org/10.17977/jptpp.v7i8.15313

Llego JH, Abdelhafiz I, Alshammari MH, and Al-Shaqri S (2019). Demographic profile and emotional intelligence of applied health sciences teaching staff: A correlation study. International Journal of Advanced and Applied Sciences, 6(10): 38-42. https://doi.org/10.21833/ijaas.2019.10.007

Mahadevan P, Srihari P, Seyon K, Vasavan P, and Panchendrarajan R (2023). Tamil grammarly: A typing assistant for Tamil language using natural language processing. In the 3rd International Conference on Advanced Research in Computing, IEEE, Belihuloya, Sri Lanka: 154-159. https://doi.org/10.1109/ICARC57651.2023.10145744

Matthews S, Kaiser K, Lum R, Moran G, Richards M, Bock S, Matthews B, and Wiles J (2025). Unearthing the latent assumptions inscribed into language tools: The cross-cultural benefits of applying a reflexive lens in co-design. CoDesign, 21(1): 1-33. https://doi.org/10.1080/15710882.2024.2339500

Ponniah K, Thannimalai T, Sathiamoorthy B, and Thirunavukkarasu S (2023). An investigation of ICT skills among Tamil language teachers in primary schools and the adequacy of ICT facilities: A quantitative study. International Journal of Advanced and Applied Sciences, 10(7): 33-41. https://doi.org/10.21833/ijaas.2023.07.005

Ramalingam K and Jiar YK (2023). The impact of KaniMani storytelling mobile application (KM-SMA) on Tamil students' speaking skills and motivation in learning Tamil. International Journal of Learning, Teaching and Educational Research, 22(1): 129-142. https://doi.org/10.26803/ijlter.22.1.8

Selvamany TF (2022). Tamilmolik karral karpittal [Tamil language teaching and learning]. Muallim Journal of Social Sciences and Humanities, 6(1): 69-73. https://doi.org/10.33306/mjssh/178

Siedlecki SL (2020). Understanding descriptive research designs and methods. Clinical Nurse Specialist, 34(1): 8-12. https://doi.org/10.1097/NUR.0000000000000493 **PMid:31789957**

Tanujaya B, Prahmana RCI, and Mumu J (2022). Likert scale in social sciences research: Problems and difficulties. FWU Journal of Social Sciences, 16(4): 89-101. https://doi.org/10.51709/19951272/Winter2022/7

Varghese NV and Mandal S (2020). Teaching–learning and new technologies in higher education: An introduction. In: Varghese NV and Mandal S (Eds.), Teaching learning and new technologies in higher education: 1-15. Springer, Singapore, Singapore. https://doi.org/10.1007/978-981-15-4847-5

Zulfiani Z, Suwarna IP, El Islami RAZ, and Sari IJ (2025). Trends in SAMR research in teaching and learning from 2019 to 2024: A systematic review. International Journal of Advanced and Applied Sciences, 12(4): 99-106. https://doi.org/10.21833/ijaas.2025.04.012