

DESIGN AND DEVELOPMENT OF T2IG APPLICATION: A NEED ANALYSIS

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Abstract: This study aims to identify the need of developing an artificial intelligence technology educational application. This application is named T2IG, an acronym for Text to InfoGraphics. Meanwhile, the ADDIE and Text Analytics models have been applied to develop T2IG applications. The researcher selected 159 Malay language teachers from Penang state primary schools. A simple random sampling method was used to determine the number of study samples in this phase. Quantitative methods using a survey approach were carried out. The findings of the descriptive analysis indicate that teachers need the development of this educational application. A total of 10 items were listed to identify the development needs of this application. Next, an inferential analysis was conducted to identify differences in the level of T2IG application development requirements. The t-test and one-way ANOVA findings show no difference in the level of T2IG application development requirements based on demographical factors. Thus, this study can contribute to education by developing an educational application with artificial intelligence elements. Using this application, students will have technological instructional material for learning the Malay language.

Keywords: Text Visualization, Artificial Intelligent, Education, Natural Language, Application Development

Introduction

Education is an asset for a country in ensuring the development of quality human capital that can compete on the global stage (Izotova, 2021.). 21st-century education has become a major practice in the education system in Malaysia. This initiative took a step since 2014 on a pilot basis and expanded in the following year (Cunningham-Nelson, 2019.). The existing education system in Malaysia has become robust with initiatives taken by the Ministry of Education Malaysia that focus on 21st-century educational practices (Padmanandam, 2021). Developments in technology today play a very important role in life. The 21st-century era is often considered the era of technology (Cunningham-Nelson, 2019).

The Covid-19 pandemic has had a drastic impact on the world education system (Liu et al., 2019.). Practices in teaching and learning activities that have long depended on the classroom are also affected, and all teaching activities are carried out with the help of technology. As a result, there is a need to provide learning aids that students can access even as the world faces a pandemic such as Covid-19. The use of technology has become a trend in 21st-century education in providing learning aids that are technological and digital (N. Yu, 2018.). The use of technology has opened up space in the world of education to facilitate students to access education from a place without time constraints and gaps between teachers (Nadezhda Izotova, 2021.).

The development of applications with technology not only bridges the gap in technology but also can bridge all groups of students with educational activities (S. Bresciani, 2018.). The integration of technologies such as artificial intelligence supports the changes in the education system, which emphasizes self-learning and teachers being facilitators inside and outside the classroom. The development of multimedia applications by combining the latest technological elements can bring students closer to teaching activities. The use of graphics in teaching can improve students' understanding and generate critical and creative thinking (C. Felix, 2017.). In addition, the use of visual media also activates students and facilitates teachers in conveying the information to be conveyed. The use of illustrations in learning and teaching can improve students' understanding, especially in understanding long texts (D. Zhang, 2021.).

Background

Problem Statement

The element of artificial intelligence is underused in the development of educational resource applications (Kucher, 2015). The development of technology has made users, especially in education, access education without the limitations of place and time. However, the development of applications that integrate text to graphics is limited (Urushima, 2021). A pilot study on Science, Technology, Engineering and Mathematics Resource Materials (STEMRM) developed by the Curriculum Management Division (BPK) for Malay language subjects involving 75 teachers and 239 students found that 63.6% of students found the use of the material challenging (Moher, 2009). The Malay language's Primary School Competency and Literacy Assessment (PKLSR) is 558. This shows an increase in reading literacy scores compared to 2012, only 398 (Jamian et al., 2012). However, the findings show that students use formal knowledge to make hypotheses on the short text and have difficulty interpreting long and complex texts (Briones-Bitar et al., 2020). A study involving fifth-year students in the study showed that students have problems in interpreting a long text. The teachers involved in this study were also interviewed, and the findings showed the delivery of content in the text to be a major problem encountered during teaching activities (Pusat Perkembangan Kurikulum.

Huraian Sukatan Pelajaran Kurikulum Standard Sekolah Rendah Bahasa Malaysia Sekolah Kebangsaan Tahun 6. Putrajaya: Kementerian Pendidikan Malaysia, 2015.).

Research Question

Based on the discussion and problem statements listed below are the research questions:

- 1) Is there a need for T2IG application development for primary school Malay language learning?
- 2) Are there differences in the level of T2IG application development requirements for primary school Malay language learning based on demographic factors?

Literature Review

The current learning situation focuses on a form of learning referred to as surface learning to deep learning through technology that makes students more effective at increasing knowledge and maintaining their engagement with strategies to focus in classroom (Briones-Bitar et al., 2020). 21st-century learning theory emphasizes several characteristics or elements, such as innovative skills, Information and Communication Technology (ICT) literacy, and collaborative learning (Raja et al., 2018).

Expertise in teaching involves the development of powerful conceptual tools for understanding student outcomes (Suparno, 2019.). Many educators know about artificial intelligence technology. However, there are still educators who are worried or incompetent to integrate elements of artificial intelligence into teaching activities. Although all countries have begun to use artificial intelligence in education, there is still a need to implement a policy to ensure its implementation becomes a reality (Afzal et al., 2012.). Artificial intelligence contains future educational development trends. Education development from academic education to knowledge education is an inevitable trend (N. Yu, 2018.). Education now focuses on how to impart knowledge based on one's abilities. The enrichment of human knowledge systems and the increase in knowledge accumulation become common knowledge (S. Liu et al., 2019.). Such knowledge is fundamental to measuring educational development. This indicates the practice of a future-oriented education system. So, technologies like artificial intelligence lead to the education of the future.

Developments in information technology have helped the education system make strides towards 21st-century education (S. Liu et al., 2019.). Multimedia applications such as 2D, 3D and 6D animation and Virtual Reality facilitate teaching and learning activities. Such educational applications encourage students to use the latest technologies in education (Valverde-Berrocoso et al., <https://doi.org/10.3390/su12125153>). This practice also helps teachers and students collaborate online and face-to-face learning modes (onsite). The use of multimedia learning materials can improve achievement among students of the Reading and Writing Guidance Program (PROBIM) (Abdul Rasid Jamian, 2180-4842.). Pupils show an increase in interest in teaching activities in the classroom (Abdul Rasid Jamian, 2180-4842.). This shows that multimedia applications can improve the achievement and interest of students to learn and master the subject.

Material and Method

Natural Language Processing (NLP) is a major field in artificial intelligence technology. This NLP technology was used in artificial intelligence in 2010 (Valverde-Berrocoso et al., <https://doi.org/10.3390/su12125153>). The use of NLP is to translate text using artificial intelligence machines. NLP has been considered a subdiscipline of artificial intelligence, and

more recently, it has been at the core of Cognitive Computing, as most cognitive processes are understood or produced as natural language speech (Valverde-Berrocoso et al., <https://doi.org/10.3390/su12125153>.).

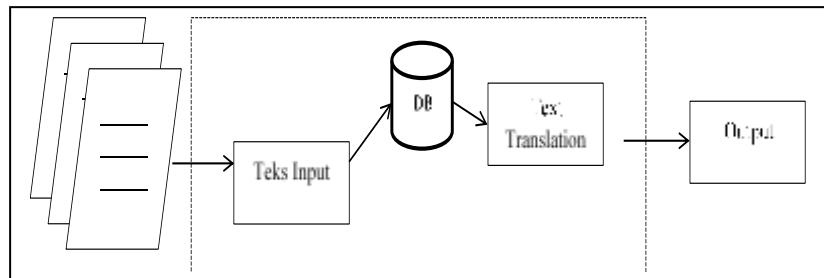


Figure 1: T2IG Application Text Translation Framework

Text Analytics that works with OpenVX allows the algorithm to be executed effectively in real-time (real-time), even if the application uses a low-power computer .(Urushima, 2021). The rationale for using this model in the development of T2IG applications is due to the use of the image filtering function used. This image filtering function requires a high resolution where each text uploaded by the user, i.e. students or teachers, will be translated in graphic form (Afzal et al., 2012). So, the OpenVX function available text analytics model allows this application to generate output perfectly. Each text inputted by the user will be processed in artificial intelligence elements to translate in graphic form and create a mapping to generate information. Since the implementation of OpenVX has to decide how to execute each function, the researcher needs to provide some context in advance so that efficient data management can be planned before implementation. So, this text analytics model is a guide in the development of T2iG applications.

The T2IG application is developed on two platforms: a website and a smartphone application. Users (students) upload text, and the GCP Cloud and GCP AI components will translate it into graphical form containing information. GCP AI will quote important content from the entire text uploaded by the user.

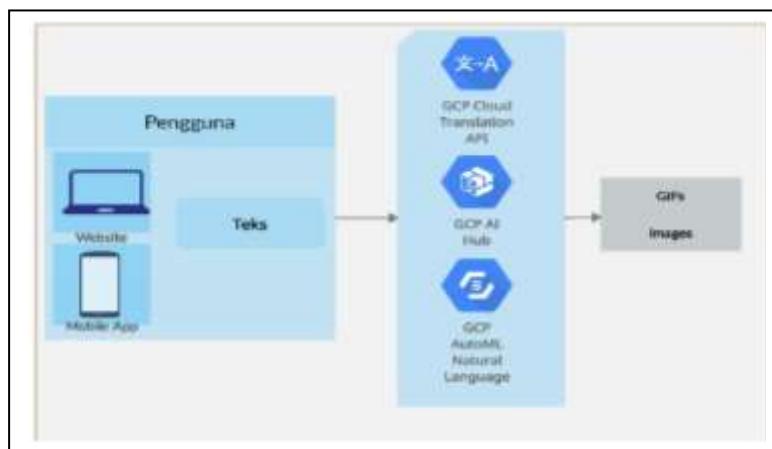


Figure 2: T2iG Application Architecture

Research Design

The quantitative design is one of the existing approaches in sociology. This design emphasizes strict procedures in determining the research variables. This study was conducted using a quantitative method with a survey approach.

Population and Sampling

Based on data provided by the Penang State Education Department (2022), 270 schools operate in the state under five districts. A total of 270 Malay language teachers became the population in this study, and based on the Krejcie and Morgan table, 159 were selected as the study sample using random sampling. The number of samples determined is also based on the recommendation of Creswell, J. W. (2012), where the determination of the number of samples is as good as more than 30 people. Thus, determining the 159 study samples from primary school in Penang can generate an accurate finding.

Research Instrument

The survey method is implemented to collect data related to the development needs of T2IG applications. The instrument developed by Che Hata, Sha'aria and Abdul Hamid (2013) and adopted by Azrin and Baharuddin (2020) in their study was adapted to identify the level of T2IG application development needs. Fig.1 show the content of instrument.

Table1: Need Analysis Instrument

No	Content		
	Dimension	Item	Total
1.	Demography	1 to 6	6
2.	Need of T2IG	7 to 16	10
	Total	1 to 16	16

Analysis Method

A descriptive analysis was conducted to answer the first research question. Mean values and standard deviations were taken into account to determine the T2IG application development needs for Malay language learning. Meanwhile, an independent sample t-test and one-way ANOVA were used to identify differences in the level of T2IG application development requirements. Table 2 shows the null hypotheses of the study and the analysis methods conducted.

Table 2: Analysis Method

Hypotheses null	Analysis Method
H_01 There is no differences in the level of T2IG application development requirements for primary school Malay language learning based on gender.	independent sample t-test
H_02 There is no differences in the level of T2IG application development requirements for primary school Malay language learning based on teaching experience.	one-way ANOVA

Result and Finding

This study aims to identify the level of need for T2IG application development for primary school Malay language learning. A total of 159 Malay language teachers participated in this study. Descriptive analysis, independent sample t-test and one-way ANOVA analysis was conducted. A research instrument containing ten items was used for data collection.

Descriptive Analysis

Descriptive analysis was conducted to identify the level of T2IG application development needs, and the findings showed a mean value of 4.56 and a standard deviation was 0.402. The result indicates that most respondents indicate a need to conduct this study. In detail, item 1 states the development of the application will help in providing better teaching and learning environment, item 4 which states development of this application will help students understand the lesson quickly and item 10 which states that the development of this application helps in making the teaching of teachers orderly and planned recorded a mean value of 4.88 and a standard deviation of 0.368. On the other hand, item 6, which states the development of this application will help provide a fun learning environment to students, recorded a low mean value compared to other items with a mean value of 4.00 and a standard deviation of 0.340. As the whole 48.2% responden agree to all the items, 50.5% strongly agree and 1.3% somewhat agree for the listed 10 items. However, overall the mean value is high, and there is a need to develop T2IG applications.

Table 3: Need Analysis Level

Item	SD (%)	DS (%)	SMA (%)	A (%)	SA (%)	Mean & Std.Dev
The development of this application will help in providing better teaching and learning environment.	0	0	0	100 62.9	59 37.1	4.88 0.368
The development of this application will help students improve their comprehension of the reading text.	0	0	0	88 55.3	71 44.7	4.39 0.358
The development of this application will help students remember what is being taught.	0	0	0	69 43.4	90 56.6	4.85 0.330
The development of this application will help students understand the lesson quickly.	0	0	0	59 37.1	100 62.9	4.88 0.368
The development of this application will help students to be able to pay attention while learning.	0	0	0	55 34.6	104 65.4	4.22 0.416
The development of this application will help in providing a fun learning environment to students.	0	0	20 12.6	100 62.9	39 24.5	4.00 0.340
The development of this application will help in making students more enthusiastic while following the learning with limited teacher guidance.	0	0	0	39 24.5	120 75.5	4.61 0.380
The development of this application will help in creating a more interactive learning environment.	0	0	0	110 69.2	49 30.8	4.46 0.733
The development of this application will help students apply what they have learned in writing.	0	0	0	88 55.3	71 44.7	4.39 0.358
The development of this application helps in making the teaching of teachers orderly and planned.	0	0	0	59 37.1	100 62.9	4.88 0.368
Average	0	0	1.3	48.2	50.5	4.56 0.402

SD (Strongly Disagree), DS (Disagree), SMA (Somewhat Agree), A (Agree), SA (Strongly Agree) Std. Deviation (Standard Deviation)

Differences in the level of T2IG application development requirements based on demographical factor

Inferential analysis was conducted with an independent sample t-test and one-way ANOVA to determine the differences in the level of T2IG application development needs based on gender factors and teaching experience. The following are the findings of the study based on the null hypothesis developed:

1. H_01 There is no differences in the level of T2IG application development requirements for primary school Malay language learning based on gender.

An independent sample t-test was conducted, and the findings shows no differences in the level of T2IG application development requirements for primary school Malay language learning based on gender.

Table 4 shows that the mean value for males is 4.45 with a standard deviation of 0.389, while female teachers have a level of need at the level of 4.43 with a standard deviation of 0.366. The t value was 1.42, with a mean difference of only 0.08. P-value = 0.140; ($p > 0.05$), so the null hypothesis failed to be rejected and showed that there was no significant difference between the gender of the teacher with the level of T2IG application development needs.

Table 4: Differences of Need Analysis Level (gender)

Gender	N	Mean	SD	t	Sig (p)
Male	79	4.45	0.389	1.420	0.140
Female	80	4.43	0.366		

2. H_02 There is no differences in the level of T2IG application development requirements for primary school Malay language learning based on teaching experience.

A one-way ANOVA test was conducted to test the hypotheses of this study, and meanwhile, the findings shows that there are no difference on need level of T2IG application development based on teaching experience.

Teachers with one to five years of teaching experience showed a high level of teacher needs with a mean value of 4.11 and a standard deviation of 0.428 and teachers with six to 10 years of teaching experience were 4.04 with a standard deviation of 0.517, and teachers experienced for 11 to 15 is showing a mean value of 4.06 with a standard deviation of 0.352. Value (F) = 1.210 with p-value = 0.306 ($p > 0.05$). Thus, the null hypothesis of the study failed to be rejected, thus proving that there was no significant difference between teachers 'teaching experience with the level of T2IG application development needs among primary school teachers.

Table 5: Differences Of Need Analysis Level (Teaching Experience)

Teaching Experience	Mean	SD	t	Sig (p)
1 to 5 years	4.11	0.428	1.210	0.306
6 to 10 years	4.04	0.517		
11 to 15 years	4.06	0.352		
16 to 20 years	4.02	0.512		
21 to dan years	3.92	0.466		

^a. Std. Deviation (Standard Deviation), Sig (p) (Significant)

Discussion on Finding

The findings show that the T2IG application development needs are at a high level, with a mean value of 4.56 and a standard deviation of 0.402. This is because there is a need to develop learning aids to ensure that students can always access learning from all places. In addition, the development of technology learning aids ensures the teaching delivering process. Artificial intelligence can help promote collaborative learning (Albahri et al., 2020). One of the most effective aspects of computer-based collaborative learning is when students are not physically in the same location. This gives students variable choices about how far and where they want to study. This suggests a need to develop and use applications that feature artificial intelligence elements. Further, (D. Zhang, 2021) stated that the findings of study indicate that text mining needs to be applied among primary school students. T2IG, which has a text mining element, also shows the need to develop.

Subsequently, an independent sample t-test showed no difference in the needs level of T2IG application development based on gender factors. This shows that all teachers regardless gender have needs of develop applications that have technological features. Also, (Narayan et al., <https://doi.org/10.14742/ajet.3974>) found that male and female teachers have similar needs in improving the effectiveness of teaching sessions. Also, stated that the use of such applications can help teachers ensure the achievement of teaching goals. Next, one-way ANOVA has shown no difference in the level of needs in developing T2IG applications based on teachers' teaching experience. The result shows that new teachers and experienced teachers need learning aids that can lead to productive teaching activities and are easily accessible by students. Finally, (Jamian et al., 2012.) found that experienced teachers and novice teachers give importance to developing creative learning aids. Thus, this also indicates no difference in application development requirements based on work experience.

Conclusion

This study aims to identify T2IG application development needs and examine the differences based on demographic factors. In conclusion, the findings of this study show that there is a need among 159 teachers to develop T2IG applications for Malay language learning. Furthermore, the findings of the inferential analysis also showed no difference in the level of need-based on gender and work experience. Thus, the development of T2IG applications can positively impact Malay language learning.

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References

- A. Y. F. Urushima, N. Tokuchi and S. Hara, "Text Mining Assessment of Sustainability Learning Topics at Higher Education in Japan," 9th International Conference on Information and Education Technology (ICIET), pp. 91-97, 2021.
- Abdul Rasid Jamian, Norhashimah Hashim and Shamsudin Othman. Multimedia interaktif mempertingkatkan pembelajaran kemahiran membaca murid-murid PROBIM. Jurnal Pendidikan Bahasa melayu ;Malay Language Education (MyLEJ), 2 (2). pp. 46-53, 2012. ISSN 2180-4842.
- Afzal, S., Maciejewski, R., Jang, Y., Elmquist, N., and Ebert, D. S., "Spatial Text Visualization Using Automatic Typographic Maps," IEEE Trans Vis Comput Graph, vol. 18, no. 12, pp. 56-64, 2012.
- Albahri, O. S., Zaidan, A. A., Albahri, A. S., Zaidan, B. B., Abdulkareem, K. H., Al-qaysi, Z. T., Alamoodi, A. H., Aleesa, A. M., Chyad, M. A., Alesa, R. M., Kem, L. C., Lakulu, M. M., Ibrahim, A. B., & Rashid, N. A. Systematic review of artificial intelligence techniques in the detection and classification of COVID-19 medical images in terms of evaluation and benchmarking: Taxonomy analysis, challenges, future solutions and methodological aspects. Journal of Infection and Public Health, 13(10), 2020. 1381–1396
- Briones-Bitar, J., Carrión-Mero, P., Montalván-Burbano, N., and Morante-Carballo, F. "Rockfall research: A bibliometric analysis and future trends," Geosciences (Switzerland), vol. 10, no. 10, pp. 1–25, 2020.
- C. Felix, A. V. Pandey and E. Bertini, "An Interactive Visualization Tool for Seamless Exploratory Analysis of Structured Data and Unstructured Text," IEEE Transactions on Visualization and Computer Graphics, vol. 23, no. 1, pp. 161-170, 2017.
- D. Zhang, J. Zhang, Y. Zhang and Y. Wu, "Sentiment Analysis of China's Education Policy Online Opinion Based on Text Mining," 9th International Conference on Information and Education Technology (ICIET), pp. 73-77, 2021.
- K. Padmanandam, S. P. V. D. S. Bheri, L. Vigesna and K. Sruthi, "A Speech Recognized Dynamic Word Cloud Visualization for Text Summarization," 6th International Conference on Inventive Computation Technologies (ICICT), pp. 609-613, 2021.
- Kucher, K., and Kerren, A, "Text visualization techniques: Taxonomy, visual survey, and community insights," IEEE Pacific Visualization Symposium, pp. 117–121, 2015.
- Moher D, Liberati A, Tetzlaff J, Altman DG, "Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement," PLoS Med, Vol. 6, no. 7, 2009.
- N. Yu, "A Visualized Pattern Discovery Model for Text Mining Based on TF-IDF Weight Method," 10th International Conference on Intelligent Human-Machine Systems and Cybernetics (IHMSC), pp. 183-186, 2018.
- Nadezhda Izotova, Marina Klimenko and Elena Nikolaenko, "Information visualization in context of modern education megatrends," E3S Web of Conferences, vol. 284, no. 9011, pp. 1-12, 2021.
- Narayan, V., Herrington, J., and Cochrane, T. Design principles for heutagogical learning: Implementing student-determined learning with mobile and social media tools. Australasian Journal of Educational Technology, 35(3), 86–101, 2019. <https://doi.org/10.14742/ajet.3974>
- Pusat Perkembangan Kurikulum. Huraian Sukatan Pelajaran Kurikulum Standard Sekolah Rendah Bahasa Malaysia Sekolah Kebangsaan Tahun 6. Putrajaya: Kementerian Pendidikan Malaysia, 2015.
- Raja, R., and Nagasubramani, P. C. Impact of modern technology in education. Journal of Applied and Advanced Research, 3(S1), 33. 2018. <https://doi.org/10.21839/jaar.2018.v3is1.165>

- S. Bresciani, P. Arora and S. Kernbach, “Education and Culture Affect Visualization's Effectiveness for Health Communication”, 22nd International Conference Information Visualisation (IV), pp. 386-389, 2018.
- S. Cunningham-Nelson, M. Baktashmotagh and W. Boles, “Visualizing Student Opinion Through Text Analysis,” IEEE Transactions on Education, vol. 62, no. 4, pp. 305-311, 2019.
- S. Liu, X. Wang, C. Collins, W. Dou, F. Ouyang, M. El-Assady, L. Jiang and D.A. Keim, “Bridging Text Visualization and Mining: A Task-Driven Survey,” IEEE Transactions on Visualization and Computer Graphics, vol. 25, no. 7, pp. 2482-2504, 2019.
- Suparno, P. Menyikapi Penggunaan Artificial Intelligence (AI, Kecerdasan Buatan) Dalam Pendidikan Fisika. Seminar Pendidikan Nasional, 1–12, 2019.
- Valverde-Berrocoso, J., del Carmen Garrido-Arroyo, M., Burgos-Videla, C., & Morales-Cevallos, M. B. Trends in educational research about e-Learning: A systematic literature review (2009-2018). Sustainability (Switzerland), 12(12), 2020. <https://doi.org/10.3390/su12125153>.