



The Evaluation of Multiple Intelligences in Preschool: Prototyping a Development

Rita Mariyana¹, Aan Listiana¹, Zaenudin Ramli², and Novi Anggraeni¹

¹ Universitas Pendidikan Indonesia, Bandung, Indonesia

² Institute Seni Budaya Indonesia, Bandung, Indonesia
ritamariyana@upi.edu

Abstract. In the 20th century, we witnessed notable progress in the domain of computing technology, ultimately leading to the creation of artificial intelligence (AI) and expert systems. Artificial intelligence (AI) and expert systems (ES) are discrete disciplines within computer science. The inclusion of this subject matter has led to the establishment of cognitive and psycholinguistics as a scholarly field, particularly regarding the assessment of diverse forms of intelligence in young individuals. The objective of this application is to integrate the assessment of childhood Multiple Intelligence into the Kurikulum Merdeka program, hence enabling customized educational strategies and identifying particular areas of proficiency and deficiency in individuals. The technique adopted in this study adheres to the Research and Development paradigm put forward by Borg and Gall. Additionally, data validity analysis was conducted using the Aiken formula. The validity of the results is demonstrated by the conclusions acquired from instrumental evaluations and qualification evaluations conducted by a panel of 32 media specialists. The assessed aspects include the Application User. Instructions Clearness, Application Content Used, App Display Size Compatibility, App Image Quality Seems Interesting and Clear, Number, Letters and Image Size Compliance, Easy-to-Read Images, Numbers, and Letters Presentation, App Design Authorization, Accuracy of Color Usage.

Keywords: Multiple Intelligences, Preschool, Aiken, R&D.

1 Introduction

The advancement of computing technology, encompassing both hardware and software, experienced transformative developments during the latter part of the 20th century, surpassing previous conceptions of the speed and integration of technology into everyday human existence [1]. The advancement and progression of technology have corresponded with the escalating intricacy of human requirements [2].

The utilization of computing technology, formerly limited to academic and military domains, has now become pervasive throughout a multitude of disciplines, including but not limited to business, health, education, psychology, and gaming [3]. This led to the subsequent advancement of computing systems aimed at facilitating human labor [4]. Artificial intelligence, also known as AI, is a subfield of computer science that encompasses the development of machines capable of doing tasks with a level of proficiency comparable to that of humans [5].

© The Author(s) 2024

M. A. Wulandari et al. (eds.), *Proceedings of the International Conference on Teaching, Learning and Technology (ICTLT 2023)*, Advances in Social Science, Education and Humanities Research 825,

https://doi.org/10.2991/978-2-38476-206-4_25

Intelligent systems refer to systems that are constructed through the utilization of artificial intelligence methodologies [6]. An Expert System refers to a program built on knowledge and designed to offer high-quality solutions to problems within a certain topic [7]. An expert system refers to computer software that emulates an expert's cognitive processes and specialized knowledge to address a specific problem [8]. The utilization of expert systems is extensively employed within the domain of psychology due to their perceived capacity to store expert knowledge on a certain topic within a computer program, hence facilitating intelligent decision-making through reasoning [9].

The intersection of psychology and expert systems led to the emergence of a field referred to as cognition and psycholinguistics. In general, the acquisition of information is derived from a human expert who possesses specialized expertise in a particular topic. The expert system then endeavors to replicate the expert's technique and performance. According to Kusumadewi [10]. One of the applications that have utilized the expert system in the domain of psychology is the creation of an expert system for assessing the intellect of children. During childhood, individuals are in a particularly vulnerable stage of development, making it crucial to carefully attend to and nurture their intellectual abilities and talents [11] (Immordino-Yang et al., 2019). A specific approach has been developed to enhance the efficiency of child intelligence detection, facilitating child psychologists in the early identification and assessment of intellectual abilities in children [12] (Snider et al., 2020).

The execution of the prototype development endeavors is grounded in the prior research and production of first prototypes, specifically focusing on the prototyping of multiple intelligence services in early childhood utilizing web-based expert systems [13] (Becker, 2020). The objective of this project is to develop a diagnostic system capable of identifying and evaluating Multiple Intelligences in children, with a specific emphasis on the early infancy stage [14] (Paolucci et al., 2023). The approach employs visual representations to analyze the expression of various intelligences and aids educators in high school and PAUD settings in comprehending the complex intellect profiles of their pupils. The result is a comprehensive educational program plan that encompasses daily and weekly schedules, as well as a self-directed curriculum.

The proposed application is expected to facilitate teachers in integrating early childhood multiple intelligence assessments in support of the program Kurikulum Merdeka. The utilization of multiple intelligence tests yields significant insights and facilitates the implementation of customized instructional techniques. These assessments facilitate the identification of a child's distinct strengths and shortcomings, hence enabling the implementation of a more focused and efficient learning strategy. The integration of feature requirements with the autonomous curriculum and the mobilizing school program results in a tailored curricular plan that automatically responds to the child's intellect, supporting teachers in curriculum development.

2 Method

The research design and method should be clearly defined. This research has been modified from its original goal and now serves as a developmental study, employing models created by Borg and Gall. The developmental stages, as outlined by Gall, Borg, & Gall [15] (Fikri et al., 2023), are as follows. The process outlined by Saidah and Damariswara [16] (Saidah & Damariswara, 2021) consists of several stages: (a) conducting a needs analysis and collecting relevant data, (b) engaging in the planning stages, (c) developing the design of the product, (d) conducting initial testing for validation purposes, (e) revising the product based on the initial testing results, (f) conducting a limited trial, (g) reviewing the product, (h) conducting field testing, (i) perfecting the final product, and (j) socializing and implementing the product. Utilizing the aforementioned growth model, we employed the three steps delineated in this study. The stages encompassed in the process are as follows: (1) conducting research and gathering relevant information, (2) formulating a comprehensive plan, and (3) creating preliminary iterations of the product. The comprehensive phase outlined can be elucidated with reference to Fig. 1.

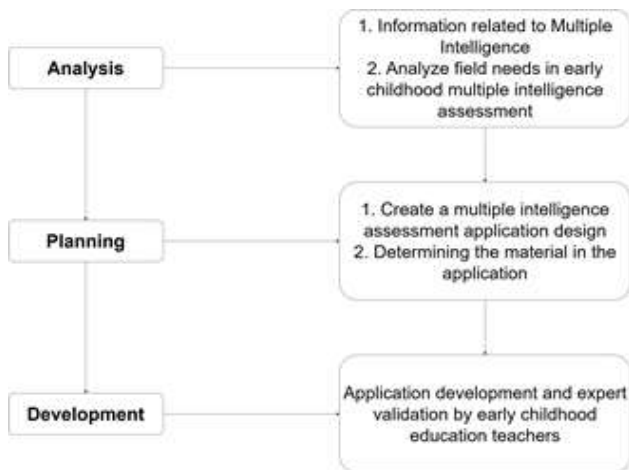


Fig. 1. Procedures for research and development of prototype multiple intelligences

The study incorporated instructors in the role of curriculum creation teams within educational institutions, while institutional leaders served as informants during the needs analysis phase. Additionally, guardians participated in initial product testing on a limited scale. Preliminary investigations were undertaken, involving the examination and contemplation of multiple intelligences assessments acquired from educators specializing in early childhood education. Following the initial product prototype.

The outcomes of the expert validation were assessed by inter-rater analysis employing the Aikens-V formula. In the compliance test, a group of 32 early childhood education teachers completed a user response questionnaire. The assessed aspects include Application User's. Instructions Clearness, Application Content Used, App

Display Size Compatibility, App Image Quality Seems Interesting and Clear, Number, Letters and Image Size Compliance, Easy-to-Read Images, Numbers, and Letters Presentation, App Design Authorization, Accuracy of Color Usage

3 Result and Discussion

The findings pertaining to the advancement of the product prototype for multiple intelligences are as follows:



Fig. 2. Initial view of multiple intelligence application

On the initial view, several menu options can be selected. First Choice Home, Sekilas, MI Test, Berita, Kontak, Login.

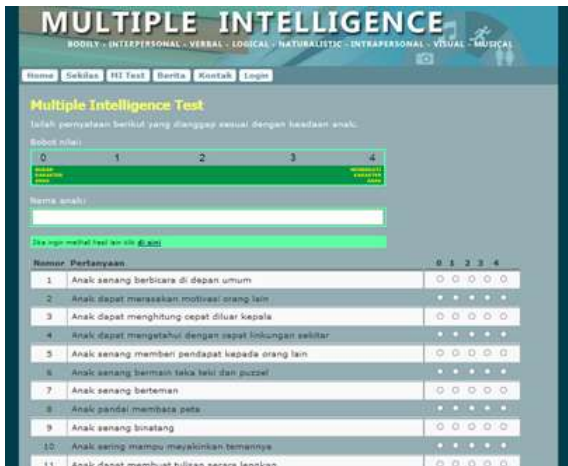


Fig. 3. Menu assament multiple intelligence

There exist various examinations designed to evaluate the diverse intelligences of young children, which can subsequently gauge the extent of their proficiency in these different domains of intelligence. The media evaluation was conducted by 32 teachers of early childhood education in the city of Bandung. The assessed aspects include Application User's, Instructions Clearness, Application Content Used, App Display Size Compatibility, App Image Quality Seems Interesting and Clear, Number, Letters and Image Size Compliance, Easy-to-Read Images, Numbers, and Letters Presentation, App Design Authorization, Accuracy of Color Usage. The validation provided by the media expert is as follows:

Table 1. Aiken validation

Item	V (Aiken Velue)	Category
1	0.90625	Valid
2	0.9375	Valid
3	0.9375	Valid
4	0.90625	Valid
5	0.84375	Valid
6	0.84375	Valid
7	0.75	Valid
8	0.75	Valid

According to the findings presented in Table 1, it is evident that expert ratings for various intelligence assessment tools, which possess validity standards exceeding 0.4, rely on AIKEN validity outcomes. Consequently, it can be inferred that the utilization of multiple intelligence assessment holds promise for early childhood educators in evaluating the intelligence of young children. The validation provided by the media expert is as follows.

The scope of this developmental study is limited to the validation stage of the product, rather than extending to the trial stage. This research employs a series of procedures in the development of applications for assessing multiple intelligences. The first stage of this investigation involved doing an analysis. The investigation was conducted by administering surveys to many kindergartens, supplemented by interviews with the kindergarten principal and early childhood education instructors. The purpose of this interview was to gather information pertaining to the circumstances, conditions, and challenges associated with various intelligence assessments in order to provide support for the program Merdeka Belajar.

The planning phase commences by delineating the plan and conceptualizing the assessment as outlined in the product draft. The draft evaluation was later introduced in a Focus Group Discussion (FGD) with a panel of media specialists specializing in the domain of early childhood education. The purpose of this endeavor is to ensure the effective functioning and alignment of numerous intelligence assessment apps with the necessary and anticipated criteria. The utilization of the Focus Group Discussion (FGD) led to the development of storyboards and materials that constituted the content of the application.

The development step involves the transformation of first drafts into various forms of intelligent devices. The finalized assessment application will thereafter be presented once more in a focus group discussion (FGD) involving specialists specializing in the field of early childhood education. The Multiple Intelligence Assessment Application will undergo validation through the use of Focus Group Discussions (FGDs) prior to its implementation in both small and large-scale testing.

Based on the aforementioned description, it can be inferred that the utilization of multiple intelligence assessment represents a versatile tool that can be tailored to suit the requirements of the early childhood domain. This tool serves to facilitate the educational process for young children by enabling the analysis of their various intelligences [17] (Emerson, 2023).

4 Conclusion

The Multiple Intelligence Application is a prototype of a product that has been specifically built for the purpose of early childhood education. The program provides a variety of menu choices and evaluations designed to examine the diverse intelligences exhibited by young children. A comprehensive media review was conducted by a group of 32 educators in Bandung, with a specific focus on evaluating user instructions, material utilization, display compatibility, picture quality, and the suitability of number, character, and image sizes. The validity of the application's intelligence evaluation capabilities was confirmed by the utilization of Aiken values, which demonstrated a significant level of validity surpassing the predetermined threshold of 0.4.

The research primarily concentrated on the validation phase, specifically excluding the trial phase. The investigation involved the utilization of questionnaires and interviews with kindergarten personnel in order to get insights into the challenges related to intelligence quotient (IQ) assessments in the context of early childhood education. The development phase involved the refinement of first drafts into advanced equipment, and the application underwent additional validation through focus group talks prior to conducting both small-scale and large-scale testing. The Multiple Intelligence Assessment Application is a versatile and thoroughly validated approach for assessing and enhancing the cognitive abilities of young children.

References

1. Holzinger, A., Saranti, A., Angerschmid, A., Retzlaff, C. O., Gronauer, A., Pejakovic, V., Medel-Jimenez, F., Krexner, T., Gollob, C., Stampfer, K.: Digital transformation in smart farm and forest operations needs human-centered AI: Challenges and future directions. *Sensors*, 22(8), 3043, (2022).
2. Stephanidis, C., Salvendy, G., Antona, M., Chen, J. Y. C., Dong, J., Duffy, V. G., Fang, X., Fidopiastis, C., Fragomeni, G., Fu, L. P.: Seven HCI grand challenges. *International Journal of Human-Computer Interaction*, 35(14), 1229–1269, (2019).
3. Sukhov, A.: Ethical issues of simulation video games. (2019).

4. Maddikunta, P. K. R., Pham, Q.-V., Prabadevi, B., Deepa, N., Dev, K., Gadekallu, T. R., Ruby, R., Liyanage, M.: Industry 5.0: A survey on enabling technologies and potential applications. *Journal of Industrial Information Integration*, 26, 100257, (2022).
5. Alam, A.: Possibilities and challenges of compounding artificial intelligence in India's educational landscape. *International Journal of Advanced Science and Technology*, 29(5), 5077–5094, (2020).
6. Zhang, Z., Wen, F., Sun, Z., Guo, X., He, T., Lee, C.: Artificial intelligence-enabled sensing technologies in the 5G/internet of things era: from virtual reality/augmented reality to the digital twin. *Advanced Intelligent Systems*, 4(7), 2100228, (2022).
7. Sarker, I. H., Hoque, M. M., Uddin, M. K., & Alsanoosy, T.: Mobile data science and intelligent apps: concepts, ai-based modeling and research directions. *Mobile Networks and Applications*, 26, 285–303, (2021).
8. Leo Kumar, S. P.: Knowledge-based expert system in manufacturing planning: state-of-the-art review. *International Journal of Production Research*, 57(15–16), 4766–4790, (2019).
9. Iatrellis, O., Stamatiadis, E., Samaras, N., Panagiotakopoulos, T., Fitsilis, P.: An intelligent expert system for academic advising utilizing fuzzy logic and semantic web technologies for smart cities education. *Journal of Computers in Education*, 10(2), 293–323, (2023).
10. Puspasari, B. D., Ardani, H. A., Stephanus, P., Pramono, A.: E-counseling for handling the selection majors problem for senior high school students in web-based using backward chaining method. *Asian Journal of Behavioural Sciences*, 1(1), 33–42, (2019).
11. Immordino-Yang, M. H., Darling-Hammond, L., Krone, C. R.: Nurturing nature: How brain development is inherently social and emotional, and what this means for education. *Educational Psychologist*, 54(3), 185–204, (2019).
12. Snider, L. A., Talapatra, D., Miller, G., & Zhang, D.: Expanding best practices in assessment for students with intellectual and developmental disabilities. *Contemporary School Psychology*, 24, 429–444, (2020).
13. Becker, C. R.: *Learn Human-Computer Interaction: Solve human problems and focus on rapid prototyping and validating solutions through user testing*. Packt Publishing Ltd, (2020).
14. Paolucci, C., Giorgini, F., Scheda, R., Alessi, F. V., Diciotti, S.: Early prediction of Autism Spectrum Disorders through interaction analysis in home videos and explainable artificial intelligence. *Computers in Human Behavior*, 148, 107877, (2023).
15. Fikri, A. A., Zuslia, V., Yusman, M., Agustanti, N. R., Diana, A. R., Muna, V. N., & Nailufa, L. E. *Biologiku: Android-Based Biology Learning Media Integration of Science, Islam and Technology*. *Proceeding International Conference on Religion, Science and Education*, 2, 699–704, (2023).
16. Saidah, K., Damariswara, R.: Development of Interactive Folklore Based on Android Oriented to Local Wisdom to Improve Reading Comprehension of Elementary School Students. *Al Ibtida: Jurnal Pendidikan Guru MI*, 8(2), 276–290, (2021).
17. Emerson, A., Min, W., Azevedo, R., Lester, J.: Prediksi awal pengetahuan siswa dalam pembelajaran berbasis game dengan representasi pertanyaan penilaian yang terdistribusi. *Jurnal Teknologi Pendidikan Inggris*, 54(1), 40-57, (2023).

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

