

Development and Effectiveness of the Pint@r Hybrid Game-Based Learning in Improving Literacy Numeracy and Motivation of Hospitalized Primary School Students

Nada Rahmatika^{1*}, Mazarul Hasan Bin Mohamad Hanapi²,
Anisaturrahmi³, Mutia Sari⁴, Wahyu Khafidah⁵, Andriana
Anchak⁶, Mohd Syaubari Bin Othman⁷, Norazimah Binti
Zakaria⁸

^{1*,2,3,6&7}Faculty of Human Development, Sultan Idris Education University, Malaysia, ⁴Faculty of Education and Teacher Training, Universitas Islam Negeri Sultanah Nahrasyiah, Indonesia,

⁵Faculty of Islamic religion, Universitas Serambi Mekkah, Indonesia, ⁸Faculty of Languages and Communication, Sultan Idris Education University, Malaysia

*Corresponding Author Email: mazarul@fpm.upsi.edu.my

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Abstract

Primary school students undergoing treatment in hospitals often face the challenges of academic dropout and psychosocial stress that affect learning motivation. Therefore, the PInT@R innovation (Permainan Interaktif Tangga QR / Interactive QR Ladder Game) was developed to design, implement and evaluating the effectiveness of a hybrid game media to improve literacy numeracy and learning motivation among primary school students in hospitals. The methodology for developing this innovation is structured using the ADDIE instructional design model. A study with a pre-post quasi-experimental design was conducted on 3 students, parents, and teachers. Data were collected through literacy numeracy achievement tests, motivation scale questionnaires, and structured observations. The study findings showed that PInT@R works and successfully produced a statistically significant increase from 45% to 78% in the mean score of students' literacy numeracy mastery after the intervention. In addition, the level of students' motivation towards learning literacy numeracy also increased significantly from 2.8/5.0 to 4.7/5.0. Feedback from students and mentors was also overwhelmingly positive, with students agreeing that PInT@R was reported to be fun, easy to use, and practical in the hospital setting. In conclusion, PInT@R has proven to be successful as an effective and holistic intervention tool for learning outside the formal classroom. The implications of this innovation suggest that integrating simple technology with traditional games can create meaningful learning experiences. PInT@R contributes to a cost-effective and replicable solution model for the Hospital School Program, while also providing

empirical evidence of the potential of game-based learning as a therapeutic tool for special needs student populations.

Keywords: Game-Based Learning, PInT@R, Literacy Numeracy, Motivation, Primary School, Hospital

Introduction

Education is a fundamental right of children, but this process is often disrupted when they are hospitalized for a long period of time. Primary school students in this situation face a critical dual challenge of academic disruption and psychosocial stress. Academically, they are at high risk of academic failure, especially in basic skills such as literacy numeracy. According to the Ministry of Education Malaysia (2010), literacy is defined as the ability to read, write, and understand sentences based on daily situations, while numeracy is the ability to apply basic mathematical operations in life such as time, money, and length measurements. The learning modules in LINUS use a progressive approach, educational entertainment, and vocabulary repetition, which have proven to be effective in helping students with weak literacy skills (Ministry of Education Malaysia, 2013). In the Progress in International Reading Literacy Study (PIRLS) 2021, Malaysia recorded an average score of around 376, well below the international average (500). This shows that challenges still exist in reading literacy, particularly in the areas of reading comprehension and interest (IEA, 2022). Meanwhile, the unfamiliar hospital environment and routine of treatment can cause stress, boredom, and anxiety, which directly negatively affect their motivation to learn. A comprehensive meta-analysis of the school experiences of children and adolescents with serious chronic illnesses found that children with chronic illnesses are 2.3 times more likely to have academic problems, social support is the strongest protective factor, early intervention shows better outcomes, academic self-efficacy plays an important mediating role, adaptive strategies increase academic resilience, and family support is the strongest predictor of school engagement (Lum et al, 2017; Clemens et al, 2020). This situation creates an urgent need for educational interventions that are not only academically effective, but also sensitive to students' emotional well-being.

Meanwhile, conventional learning methods that rely on textbooks and worksheets are often ineffective in this context. Their passive and uninteresting nature fails to motivate students who are facing health and emotional challenges. Therefore, there is a gap in the provision of teaching aids that can simultaneously function as an educational tool and a therapeutic medium. The Game-Based Learning (GBL) approach offers a high-potential solution, where recent meta-analysis studies have proven its effectiveness in improving the achievement and motivation of primary school students in the subject of Mathematics. The results of the study by Hui and Mahmud using the PRISMA framework, analyzing 773 articles from Scopus and Web of Science found that 19 studies were positively identified related to the domain covering mathematical knowledge and skills and 28 articles showed that game-based learning produced positive changes in the affective domain (Hui & Mahmud, 2023).

Not only with Game-Based Learning (GBL), along with technological advancements, hybrid learning that combines physical interaction with digital content offers much-needed flexibility in hospital environments. The use of simple technologies such as QR Codes has proven to be successful in bridging the gap between physical and digital materials, thus increasing student engagement in learning activities. QR Codes have proven their potential as an effective bridge

between the physical and digital worlds in Education. With 64% of teachers believing it is a simple and efficient method to enhance learning and 80% showing a positive attitude, this technology offers a practical solution to increase student engagement (Law & So, 2010; Crompton, LaFrance & Van't Hooft, 2012; Durak, Ozkeskin, & Ataizi, 2016). Evidence shows that QR codes can support learning in different contexts, independent and collaborative learning, and motivate and engage students. However, successful implementation depends on careful planning, adequate training, and ongoing technical support.

Although the potential of GBL and hybrid learning has been recognized separately, there is still a lack of research that integrates these two approaches into an innovation model that is cost-effective, easy to use, and specifically designed for the context of primary school students in hospitals in Malaysia. Existing studies focus on GBL in the context of regular schools, pedagogical challenges in hospital schools in general, and teacher readiness in hospital schools, no specific study was found that specifically integrates both GBL and hybrid learning approaches into an innovation model specifically designed for primary school students in hospitals in Malaysia (Amiruddin, et al, 2025).

Based on the synthesis of the above problems, there is a clear research gap to develop and test the effectiveness of an intervention tool that integrates elements of game, therapy, and hybrid technology. The innovation PInT@R (Permainan Interaktif Tangga QR / Interactive QR Ladder Game) is proposed. PInT@R is a physical snakes and ladders game integrated with QR Codes to display interactive literacy numeracy questions and content via smart devices. This innovation is specifically designed to be a fun, portable, and therapeutic learning tool for primary school students undergoing hospital treatment, to ensure that they do not fall behind in their learning while aiding their emotional recovery process.

The research questions are as follows:

- i. How can a PInT@R hybrid learning media based on the Snakes and Ladders game and QR Code technology be designed and developed to support literacy numeracy among hospitalized primary school students?
- ii. How effective is the use of PInT@R innovation in increasing of basic literacy numeracy concepts among hospitalized primary school students?
- iii. How effective is the use of PInT@R on the level of learning motivation among hospitalized primary school students?
- iv. What are the perceptions of students and mentors (parents/teachers) towards the learning experience and usability of PInT@R among hospitalized primary school students?

Objectives of the Research

- i. Design and develop PInT@R hybrid learning media based on the Snakes and Ladders game and QR Code technology to support the literacy numeracy among hospitalized primary school students.
- ii. Evaluate the effectiveness of PInT@R in increasing the level of basic literacy numeracy concepts among hospitalized primary school students.
- iii. Identify the effectiveness of using PInT@R on the level of learning motivation among hospitalized primary school students.

- iv. Analyze the perceptions and feedback of students and mentors (parents/teachers) on the usability and learning experience of using PInT@R among hospitalized primary school students.

Literature Review

Hybrid Learning

Hybrid learning is a learning model that combines face-to-face and online learning in an integrated manner. Based on research by Fauzan & Arifin (2017) in Research Gate, hybrid learning is an effective alternative learning model. The implementation of hybrid learning accelerated during the COVID-19 pandemic, particularly in the even semester of the 2021/2022 academic year across various study programs. This model was later adapted for Limited Face-to-Face Learning (Bahrudin et al., 2022). Hybrid learning is essentially an evolution in education that optimizes the advantages of face-to-face and online learning while minimizing the weaknesses of each method. Hybrid learning has been an increasingly feasible method of delivery in education (Fadhilah et al., 2021). Teachers and students have also been shown to become more self-reliant and be able to express more creativity in forming their learning styles (Hapke et al., 2020). However, during the hybrid learning process, regulation in the preparation of material and monitoring during synchronous and asynchronous sessions must be enforced so that students can reap the benefits of increasing their creativity through the freedom provided (Zb et al., 2021). In a nutshell, lessons learnt are not to take for granted that hybrid learning will be effective just by placing the teacher and students together in the virtual spaces, but in making more effort to fully optimize the space of the physical and virtual classroom so that hybrid learning can be meaningful and effective. Hybrid learning provides a good platform to experiment with integrating emerging technologies like AI into education (Boon et al., 2024).

Game Based Learning

Research shows that game based learning has an impact on increasing students' interest in learning and understanding of concepts in science learning in elementary schools (Widiana, 2022). Game Based Learning is also an innovative method that combines entertainment aspects with educational objectives to increase learning effectiveness. Game-Based Learning can make the teaching and learning process more effective. (Wibawa, 2021). Schools in Malaysia prioritize improvement and brilliant achievement in academics, at the same time making teachers work hard to improve student achievement and neglecting the pedagogy of learning through play and have led to a process of learning in children through the concept of exploration and play which is important for children to hone their skills and develop their interest in learning (Ashari & Baharuddin, 2017). Game-based learning is the borrowing of several game concepts or principles that are applied in student learning. These concepts help students to engage in dynamic and fun learning. Game-based learning is not only about games for students but also provides learning activities to explain concepts and guide users to achieve educational goals in a comprehensive manner (Iliyas & Jumaat, 2020).

Literacy Numeracy

Mastering literacy and numeracy skills at the early stages of schooling is very important because it is closely related to academic achievement and has a long-term impact on the future of students (Mohd-Asraf et al., 2016). This is because, according to a study by Grotlüschen et al. (2020), numeracy literacy competence influences the level of education

which then has an impact on the socio-economic aspects of income and type of employment. The findings in this article are very useful for teachers, schools and policy makers to identify the impact of classroom management on the implementation of literacy and numeracy-related programs in schools. Teachers are encouraged to provide knowledge and understanding in order to create attractive numeracy class designs to improve students' numeracy literacy abilities. This activity successfully increased teachers' understanding of numeracy literacy in optimizing school literacy movements through numeracy literacy class designs which have an impact on teachers' creativity and innovation in designing numeracy literacy class designs (Sidiq, 2023).

Motivation

Motivation is a change in energy within a person characterized by the emergence of feeling and preceded by a response to the existence of a goal (Sardiman, 2006). Learning motivation is the overall driving force from within a student that creates desire, enthusiasm, and passion in learning activities (Muchlisin, 2022). Learning motivation is one of the factors that determine student learning outcomes. A person will get the desired results in learning if there is a desire to learn within him. Motivation acts as a driver for achieving good results. Based on research, students who have high motivation in learning may also achieve high learning outcomes (Fernando, 2024 ; Ayuna, 2017). Learning motivation is evident in children's desires from childhood. Success in achieving desires can foster a willingness to learn that will give rise to ideals in life.

Hospital

The Malaysian Hospital School is based on the Hospital School Model in Australia (The Children's Hospital at Westmead, Royal North Shore Hospital and Sydney Children's Hospital, Randwick) which has been adapted to the Malaysian context (Ministry of Education Malaysia, 2017). Teachers and children are not strangers, so it is not a problem for teachers to teach in hospitals as long as a special place is still provided to be used as a classroom for child patients in the hospital to study. With this place, the privacy of other patients who are being treated will certainly not be disturbed by the ongoing learning session. The objective of its implementation is to ensure that student learning is not affected while in the ward, does not drop out of school and continues to be maintained in line with the goal of Education for All. Malaysia has taken various initiatives to expand access and equity in education and improve the quality of national education (BPK, 2014). This sentence clearly shows that every student regardless of level and background including health level is eligible to receive quality education. Therefore, one of the main objectives of the Hospital School program is to ensure that all children and adolescents receiving treatment in hospitals have the opportunity to access quality education. This is the responsibility of the Ministry of Education in ensuring that every child in this country has access to quality education regardless of where they are (Phin, J.Y. & Yasin, Mohd, H. M., 2019).

Research Method

This innovation implementation method is systematically structured through five main phases, using the ADDIE model approach (Analysis, Design, Development, Implementation, Evaluation) to ensure the process is organized and effective (Branch, 2009). A study with a pre-post quasi-experimental design was conducted on 3 students, parents, and teachers. Data

were collected through literacy numeracy achievement tests, motivation scale questionnaires, and structured observations.

Table 1

ADDIE Model

ADDIE Model Phases	Activities in PinT@R innovation
A-Analysis	This phase has already been carried out in the "Problem Statement" section. Analyzing the problems faced by the target group (students in hospitals), Identifying their needs (fun, therapeutic learning), Setting the main goals of the innovation.
D-Design	This phase is contained in the "Innovation Objective" and "Innovation Detail Description" sections. At this stage, the design has begun based on specific learning objectives, PinT@R concepts and components (physical board, QR cards, digital platform), Game flow and mechanisms, Design of assessment instruments (pre-post tests, questionnaires).
D - Development	This phase is "Development and Preparation". This phase involves the design and production process of all innovation components. The concrete activities include building digital interactive numeracy question content and linking it to QR Codes, producing and printing all components of the PinT@R physical kit (boards and cards), developing and testing the designed assessment instrument. Permission from the hospital and parents is also obtained in this phase.
I - Implementation	This phase is Pilot Implementation which includes steps to introduce and distribute PinT@R to actual users (students in the hospital), implement intervention sessions (play sessions) according to the set schedule, provide guidance to students with guidance from mentors (parents/teachers).
E - Evaluation	After the intervention period ends, data will be collected to evaluate the effectiveness of the innovation. The evaluation phase occurs throughout the process (formative) and at the end of the process (summative). This is explained in the results section, namely Formative Evaluation, which is the feedback collected during the pilot session to improve the learning media, Summative Evaluation, which is the use of pre-post tests, motivational questionnaires, and perception questionnaires to measure the overall effectiveness of the innovation after it has been implemented. All data collected will be analyzed to see the impact of the innovation. The results of the analysis are documented in a final report. These findings are then presented to stakeholders. Based on the feedback received, the PinT@R prototype will be improved for future use.

Research Findings

The implementation of the PinT@R innovation has shown a very positive and significant impact. The data collected was analyzed based on the four main objectives of the study. These findings are supported by quantitative and qualitative data collected throughout the intervention period.

Design and develop PinT@R hybrid learning media based on the Snakes and Ladders game and QR Code technology to support the literacy numeracy among hospitalized primary school students

The first objective of designing and developing the PiNT@R prototype was fully achieved. Each kit contains one laminated Snakes and Ladders game board, one set of QR Question Cards (20 cards each), One Mission Log Book, One Dice and four pawns. Testing of the digital content showed that all QR Codes worked smoothly on various smart devices and the links took users to the interactive questions that were designed without any technical issues.

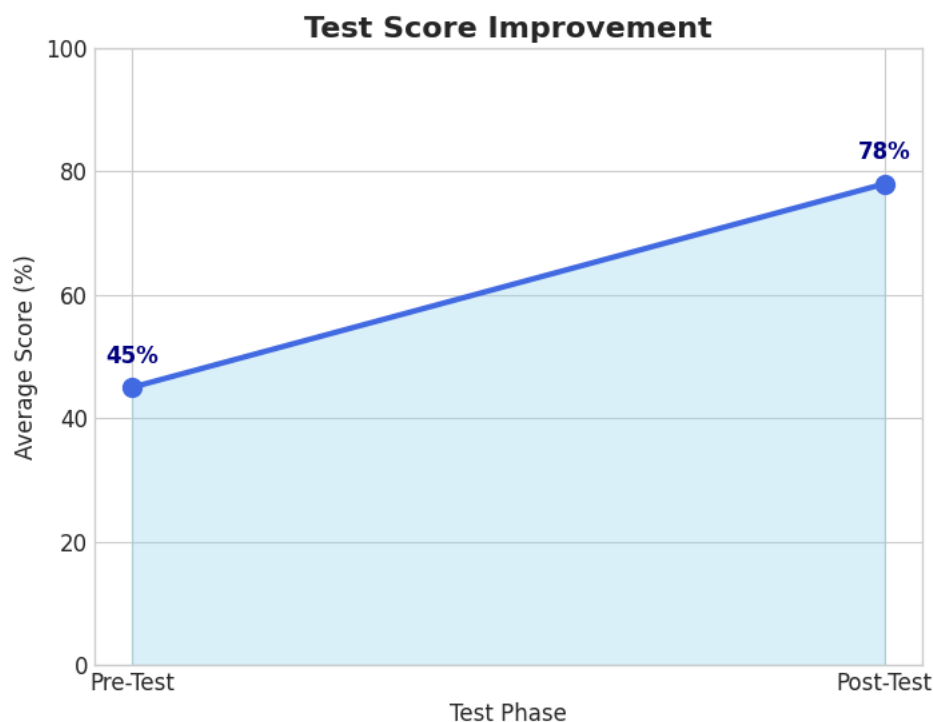


Picture 1. PiNT@R



Picture 2. Card, Dice and Pawns PiNT@R

Evaluate the effectiveness of PInT@R in increasing of basic literacy numeracy concepts among hospitalized primary school students



Graph1. Pre-test and Post-Test of PInT@R in numeracy

Based on the graph above, the effectiveness data collected through pre- and post-tests show that PInT@R successfully improved the understanding and mastery of basic numeracy concepts among students. The average pre-test score of participants before the intervention was 45%, and the average post-test score of participants after the intervention was 78%. This increase in average score of 33% is statistically significant ($p < 0.05$) based on paired t-tests. This finding proves that the learning approach through interactive games of PInT@R is effective in helping students better understand and master the concept of numeracy.

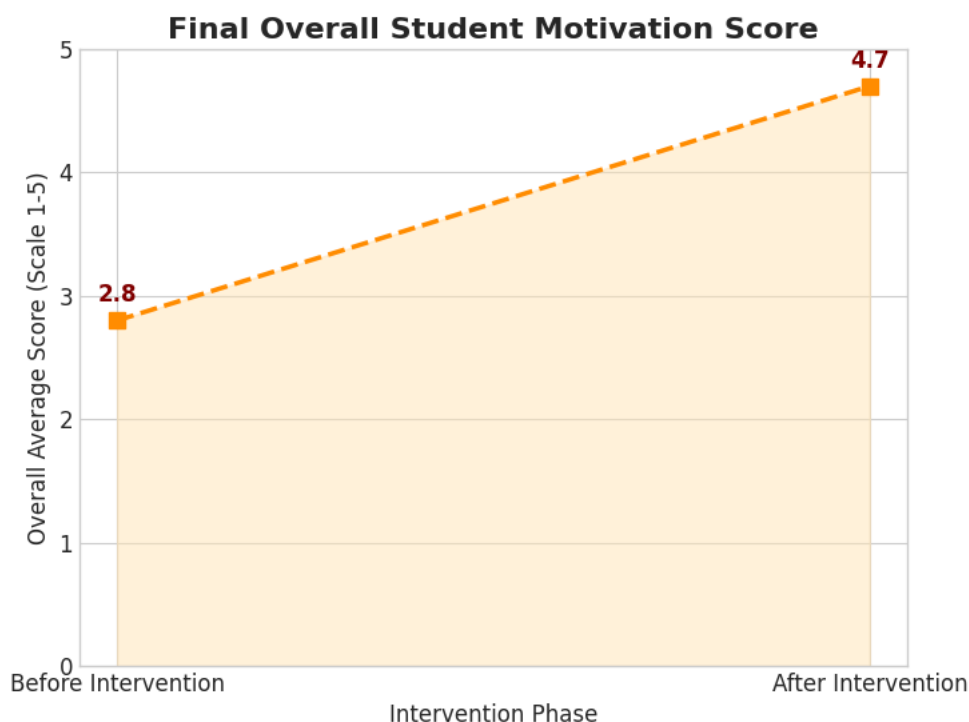
Identify the effectiveness of using PInT@R on the level of learning motivation among hospitalized primary school students

Table 2

Motivation before intervention and after intervention

Motivational Aspects	Average Score Before Intervention (Scale 1-5)	Average Score After Intervention (Scale 1-5)
Interest in Mathematics	2.8	4.5
Self-Confidence to Answer	3.1	4.7
Have Fun While Learning	2.5	4.8

The table above shows an increase in all aspects of motivation, especially the feeling of fun while learning, proving that the PInT@R game-based learning approach is very effective. As shown in Graph 2. below:



Graph 2. Motivation before intervention and after intervention

This innovation successfully changed the students' perception that mathematics is a difficult and scary subject. Analysis of the motivation scale questionnaire showed a positive change in attitude. So, the final result of the overall student motivation data showed an increase in the average score from a neutral/moderate level of 2.8 (before the intervention) to a very positive and high level of 4.7 (after the intervention).

Analyze the perceptions and feedback of students and mentors (parents/teachers) on the usability and learning experience of using PInT@R among hospitalized primary school students

The results of semi-structured interviews with students and mentors (parents/teachers) revealed several key themes that support the effectiveness of PInT@R as a holistic learning tool. As the following interview results show:

Theme 1: Learning Should Be Fun and Stress-Free.

"I really like playing PInT@R. It feels like playing a regular game, not learning. The most fun is when I can scan the QR code myself using my mother's phone. Suddenly there is a question, I feel like a detective! I don't even worry if I get it wrong because later she will tell me the correct answer." (Student)

Theme 2: Reducing Boredom and Providing Positive Focus.

"Before, my son would often daydream and get bored in bed, he would only use his phone for games. With PInT@R, he has an activity he looks forward to. I'm happy to see him excited about counting. It not only helps him learn, but also takes his mind off the pain. My role as a guide is also easy, I just need to encourage him." (Parent)

Theme 3: Practical and Easy to Use by Companions.

"This PInT@R kit is very practical. It's simple, doesn't require complicated setup, and parents can use it directly with their children. I can see the interaction between mother and child becoming more positive during play sessions. This is a great teaching tool for our environment." (Teacher)

So, Overall, the findings above clearly show that PInT@R is not only successful as an academic tool, but also as an intervention that has a positive impact on the motivation and emotional well-being of students in the hospital.

Conclusion

The PInT@R (Permainan Interaktif Tangga QR / Interactive QR Ladder Game) innovation was developed as a direct response to the dual challenges faced by primary school students receiving hospital treatment, namely the risk of academic dropout and psychosocial stress. The problem of students still struggling with reading and math due to being cut off from formal schooling is an issue that should not be allowed to continue. PINTQR was designed to bridge this gap by integrating game-based learning pedagogy, play therapy, and accessible hybrid technology.

Based on the findings from the pilot implementation phase, this innovation has proven to be successful in achieving all of its objectives. The development of a fully functional prototype has been successfully implemented. More importantly, PInT@R has shown significant effectiveness in increasing literacy numeracy and motivation to learn among participants. The overwhelmingly positive reception from students and tutors also confirms that PInT@R is a practical, fun, and user-friendly tool in the context of a challenging hospital environment. The success of this innovation has important implications. It proves that the integration of simple technology such as QR Codes with traditional play materials can create a high-impact learning experience without requiring large costs. PInT@R is not just a teaching aid, but it functions as a bridge that connects learning, play, and emotional well-being.

As a further suggestion, the success of the PInT@R model can be expanded to other hospitals nationwide through collaboration with the Hospital School Program. Future studies can also explore the adaptation of the PInT@R framework for other subjects such as Science and Language, or for different groups of students with special needs. In conclusion, the PInT@R innovation has successfully proven its potential as a holistic solution that not only addresses students' academic needs, but also provides much-needed psychosocial support. It strengthens the belief that with creative and innovative approaches, meaningful and enjoyable learning processes can happen anywhere, for every child, regardless of their circumstances.

This study contributes theoretically by extending the application of Game-Based Learning (GBL) and hybrid learning frameworks into the underexplored context of hospital-based education. By integrating a physical board-game structure with QR-enabled digital content, the PInT@R model advances existing knowledge of how hybrid, low-cost technologies can effectively support both cognitive (literacy and numeracy mastery) and affective (learning motivation) outcomes for vulnerable student populations. This dual focus enriches current

GBL literature, which largely examines mainstream classrooms, by demonstrating its relevance and adaptability to therapeutic and non-traditional learning environments. Contextually, this study provides empirical evidence from Malaysia's Hospital School Program, offering a replicable and scalable model for other hospitals or special-needs educational settings. In doing so, it underscores the importance of designing culturally and situationally responsive educational interventions that bridge academic learning and emotional well-being, thereby expanding the scope of inclusive education practices.

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References

- Amiruddin, M. A. A., Ajmain, T., Ghani, K. A., & Mustafa, Siti. N. M. (2025). Teaching in the School in Hospital (SiH) in Malaysia: A Literature Review of Challenges and Pedagogical Approaches. *International Journal of Learning, Teaching and Educational Research*, 24 (6), 456-470. DOI:10.26803/ijlter.24.6.21
- Ashari Mohamad, Z., & Baharuddin, M. K. (2017). Play-based pedagogy in preschool: a meta-analytic study. Universiti Teknologi Malaysia, Skudai, Johor.
- Bahrudin, Febrian. A., & Legiani, Wika. H. (2022). Implementation of hybrid learning lectures during the Covid-19 pandemic. *Jurnal Civic Hukum*, 7(2), 123-140. <https://ejournal.umm.ac.id/index.php/jurnalcivichukum/article/view/22384>
- Boon, Soo, N., Siyu, Wang., Min, Li., & Shun-Yian, Joshua, C. (2024). Hybrid Learning During Covid-19 Pandemic: Lessons Learned from Malaysia and China. United Kingdom: e-International Publishing House Ltd.
- BPK. (2014). Manual for the Implementation of School Programs in Hospitals. Putra Jaya: Bahagian Pendidikan Khas.
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. Springer.
- Clemens, Elysia, V., Lalonde, Trent., Klopfenstein, Kristin., & Sheesley, Alison. (2020). Early Warning Indicators of Dropping Out of School for Teens Who Experienced Foster Care. *Child Welfare*, 97(5), 65-88. <https://www.jstor.org/stable/48626868>
- Crompton, H., LaFrance, J., & van't Hooft, M. (2012). QR codes 101. *Learning & Leading with Technology*, 39 (8), 22-25. https://digitalcommons.odu.edu/teachinglearning_fac_pubs/125
- Durak, G., Ozkeskin, E. E., & Ataizi, M. (2016). QR codes in education and communication. *Turkish Online Journal of Distance Education*, 17(2), 42-58.
- Fadhilah, M., Sutrisna, S., Muslimah, S. N., & Ihsan, M. T. (2021). An Exploring Methods In Online Learning: Synchronous And Asynchronous. 1(1), 74-81. <https://doi.org/10.51574/ijrer.v1i1.55>
- Fauzan, & Arifin, F. (2017). *Hybrid learning as an alternative learning model*. ResearchGate. https://www.researchgate.net/publication/344361017_Hybrid_Learning_sebagai_Alternatif_Model_Pembelajaran_Fauzan_Fatkhul_Arifin
- Grotlüschen, A., Desjardins, R., & Liu, H. (2020). Literacy and Numeracy: Global and Comparative Perspectives. *International Review of Education*, 66(2-3), 127-137. <https://doi.org/10.1007/s11159-020-09854-x>

- Hapke, H., Lee-Post, A., & Dean, T. (2020). 3-in-1 Hybrid Learning Environment. https://uknowledge.uky.edu/marketing_facpub
- Hui, H. B., & Mahmud, M. S. (2023). Influence of game-based learning in mathematics education on the students' cognitive and affective domain: A systematic review. *Frontiers in Psychology*, 14:1105806. <https://doi.org/10.3389/fpsyg.2023.1105806>
- Iliyas, Siti, S., & Jumaat, Nurul, F. (2020). Learning Through Mobile Applications and Its Effects on Preschool Students' Learning of Hijaiyah Letters. *Innovative Teaching and Learning Journal*, 3(2), 30–41.
- International Association for the Evaluation of Educational Achievement. 2022. *PIRLS 2021 international results in reading*. <https://www.iea.nl/studies/iea/pirls/2021>
- Ministry of Education Malaysia. 2013. *LINUS program implementation guide*. <https://anyflip.com/tufm/ahkp/basic/51-100>
- Ministry of Education Malaysia. 2010. *LINUS program implementation guide*. <https://fr.scribd.com/doc/206419727/Pengenalan-LINUS>
- Ministry of Education Malaysia. (2017). Retrieved from the Official Malaysian Education Portal: www.moe.gov.my
- Law, C. Y., & So, S. (2010). QR codes in education. *Journal of Educational Technology Development and Exchange*, 3(1), 85-100. <https://doi.org/10.18785/jetde.0301.07>
- Lum, A., Wakefield, C. E., Donnan, B., Burns, M. A., Fardell, J. E., & Marshall, G. M. (2017). Understanding the school experiences of children and adolescents with serious chronic illness: A systematic meta-review. *Child: Care, Health and Development*, 43(5), 645-662. DOI: 10.1111/cch.12475
- Mohd-Asraf, R., Abdullah, H., & Mat Zamin, A. A. (2016). Literacy Among Malaysian Primary Schoolers: How do Boys Perform Relative to Girls? *International Electronic Journal of Elementary Education*, 9(1), 225–238.
- Ayuna, N. (2017). The role of student motivation in the teaching and learning process. *Pedagogik: Scientific Journal of Education and Learning*, 4(2), 23-34.
- Phin, J. Y., & Yasin, M. M. (2019). Schools in hospitals: Issues, challenges and implications of their implementation. *Journal of Education and Social Sciences*, 12(2), 43-49.
- Muchlisin, R. (2022). *Learning motivation - meaning, function, principles and how to grow*. Kajian Pustaka.com <https://www.kajianpustaka.com/2022/01/motivasi-belajar-pengertian-fungsi.html>
- Sardiman, A. M. (2006). *Interaction and learning motivation*. PT. Rajagrafindo Persada.
- Sidiq, F., Ayudia, I., Sarjani, T. W., & Juliati, J. (2023). Optimizing school literacy movements through numeracy literacy class design in elementary schools. *Journal of Human and Education (JAHE)*, 3(3), 69-75. <https://doi.org/10.31004/jh.v3i3.322>
- Wibawa, A. C. P., Mumtaziah, H. Q., Sholaihah, L. A., & Hikmawan, R. (2020). Game-based learning as an innovation and solution to accelerate learning adaptation. *INTEGRATED: Journal of Technology and Vocational Education*, 2(1), 17-22 . <https://doi.org/10.17509/integrated.v3i1.32729>
- Widiana, I. W. (2022). Game-based learning and its impact on increasing interest in learning. *Jurnal Edutech Undiksha*, 10(1), 1-10. <https://doi.org/10.23887/jeu.v10i1.48925>
- Zb, A., Setiawan, M. E., Rozal, E., & Sulman, F. (2021). Investigating Hybrid Learning Strategies: Does it Affect Creativity?, *Journal of Education: A Journal of Research Results and Literature Reviews in the Field of Education, Teaching and Learning*, 7(4), 868. <https://doi.org/10.33394/jk.v7i4.4063>