

Readiness of Educational Institutions in Utilizing Immersive Technology in Learning

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Abstract

The implementation of technology-enhanced learning in educational institutions is a key indicator of progress and quality. Its successful execution requires a well-established planning process, manifested in the form of readiness measurements. To assess the readiness level for the implementation of e-learning, it is essential to conduct an evaluation of e-learning readiness. This research aims to provide an overview of the general readiness levels of educational institutions collaborating with SEAMOLEC in incorporating immersive technology for learning. The study utilizes the ELR Aydin Tasci model, focusing on four readiness factors: Technology, Human Resources, Innovation, and Self-Development. The findings indicate that two factors, namely technology and self-development, are classified as 'Not Ready' and require minor improvements. On the other hand, human resources and innovation are classified as 'Ready' but also require slight enhancements. The average score obtained, 3.48, reflects a readiness level of 3. In conclusion, the overall readiness of the analyzed educational institutions is categorized as 'Ready' with room for slight improvement.

Keywords: Aydin Tasci, Educational Institution, E learning readiness, Immersive Learning Technology

Background

The policy encapsulated in the concept of "Merdeka Belajar" fundamentally strives to create a more effective, proactive, creative, innovative, independent learning and teaching system and culture that aligns with global changes in the current educational landscape (Suwatno, 2023). The Merdeka Belajar curriculum encourages students to actively participate in the learning process by autonomously choosing their learning paths. When students have personal interest and engagement in a specific topic or project, they are more likely to actively participate in exploring the material, engaging in discussions, and contributing to the learning environment.

Despite various proposed learning methods, immersive learning has recently been advocated. "Immersive" describes a profound learning experience where students directly engage through touch, sight, hearing, or sensation, actively involving themselves with objects, environments, or situations. Immersive learning experiences in an educational context depict scenarios where students are fully engaged in the learning process and feel entirely connected to the studied material. While immersive learning doesn't necessarily require technology, it involves direct experiences such as laboratory work, museum visits, historical sites, and other relevant locations related to the curriculum.



In cases where immersive learning is impractical, a virtual environment can be created to simulate the real world using supportive technologies like VR headsets. Immersive technology refers to the technology used to create immersive learning experiences.

Several digital technologies facilitate immersive learning, including virtual reality (VR), augmented reality (AR), and mixed reality (MR). These technologies are categorized as immersive technologies and collectively termed extended reality or cross-reality (XR) (Mystakidis and Lympouridis, 2023). With immersive technology-enhanced learning, students can experience real sensations and engage in profound learning experiences, enhancing understanding and retention of learning materials (Tang et al., 2020).

Aligned with the Merdeka Belajar curriculum, immersive technology-enhanced learning shares a common focus on providing active and profound learning experiences for students. Both approaches grant students the freedom to control their own learning processes and encourage high engagement with the learning material. Merdeka Belajar with immersive technology can create a dynamic, creative, and motivating learning environment where students can develop deep understanding and sharpen skills relevant to the real world.

The implementation of technology-enhanced learning in educational institutions is a key indicator of progress and quality for an institution. Therefore, a well-established planning process, in the form of readiness measurements, is essential for its successful implementation. The readiness to conduct technology-enhanced learning is often referred to as E-Learning Readiness (ELR) or E-Readiness. Saleppa et al. (2022) describe that by measuring ELR, organizations or schools can easily determine their readiness level in implementing technology in the learning process, facilitating the formulation of policies for future technology-enhanced learning implementations.

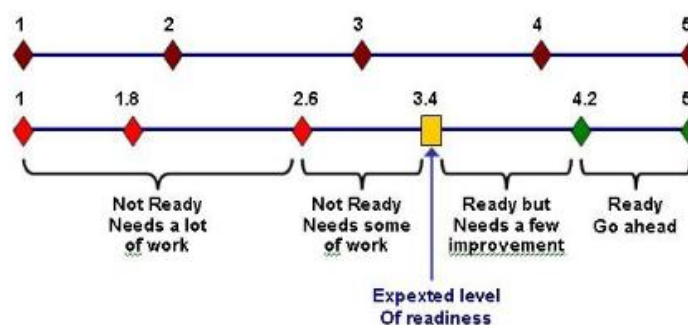
In measuring ELR, the ELR model is based on factors that will be utilized. The E-Learning Readiness model can be implemented using various models, one of which is the Aydin and Tasci ELR model. This model assesses readiness levels based on four aspects: (1) technology, (2) human, (3) innovation, and (4) self-development. This model is often used to gauge a school's readiness in implementing technology-enhanced learning. The measurement of school readiness for learning utilizing immersive technology will be adapted according to the specific conditions in the school environment.

Research Method

This study employs a quantitative approach with a descriptive method. Quantitative data, in the form of numerical figures, are collected and subsequently analyzed to generate generalizations about the readiness of an institution in implementing imtech-enhanced learning. The analysis results will be in the form of a description that explains the level of readiness, highlighting both weak factors and those already categorized as ready.

The model utilized in this research is the ELR (E-Learning Readiness) Aydin & Tasci model to assess the readiness for implementing technology-enhanced learning. The ELR Aydin & Tasci model has been developed and adapted for use in this study. This model incorporates four readiness factors: technology, innovation, human resources, and self-development. The model assigns a readiness score for the implementation of technology-enhanced learning in a school. It can be applied both before implementation, providing readiness score results, and after implementation, offering evaluative insights for subsequent implementation.

The e-learning readiness scores, once obtained, will be evaluated to identify which factors are still weak and which are ready for the implementation of e-learning.



Pic 1. Aydin and Tasci Measurement Scale 2005 (Esa, et al: 2021)

The following is the elaboration of each factor:

1. Technology: Availability of internet (minimum 25 Mbps); Adequate availability of computers and VR devices in schools, allowing teachers and students to work/learn individually; and Imtech enhanced Learning Content
2. Human Factor: Teachers/lectures have basic skills in accessing the internet and using computers; Teachers/lectures are familiar with immersive technology-enhanced learning and have experience using immersive technology; Students have basic skills in accessing the internet and using computers; Students are familiar with immersive technology-enhanced learning and have experience using Imtech.
3. Innovation Factor: Acceptance of innovation/updates in the utilization of immersive technology by teachers/lectures, students, and institutional stakeholders. Ability of teachers/lectures, students, and institutional stakeholders to adapt to changes or innovations in immersive technology; Positive reception of innovations/technological updates in the immersive field by teachers/lectures, students, and institutional stakeholders.
4. Self-Development Factor: Availability of budgetary funds allocated for the development and use of immersive technology; Allocation of time in school board/committee meetings to discuss budgets for immersive technology; Recognition by the institution of the significant potential of utilizing immersive technology in learning.

The technique employed to gather data for this research is a questionnaire. The questionnaire consists of a series of written questions adapted and customized from the Aydin & Tasci questionnaire, with questions structured around the four factors of imtech implementation readiness. There are 21 question items adopted and adapted from the ELR Aydin & Tasci model instrument. The instrument was initially translated into Indonesian and adjusted for the purpose of measuring the readiness level in schools. Out of the total 21 question items, there are 4 questions for the technology factor, 11 questions for the human resources factor, 3 for innovation, and 3 for self-development. Subsequently, the instrument, including each factor and question item, was validated by experts. Once validated, the instrument underwent further refinement and improvement. After the instrument was declared valid and met the criteria, it was pilot-tested to determine its validity and reliability. The instrument, in the form of a questionnaire, was distributed to respondents through Google Form for online completion. The following is the list of questions in the validated questionnaire.

Table 1 A List of Questions

No	Questions	Factor
Q1	Is there internet access with a speed of 25 Mbps available in your school/campus environment?	Technology
Q2	Are there computers/laptops with processors equivalent to Intel Core i5 or AMD Ryzen 5 and 8GB RAM available in your school/campus?	Technology
Q3	What is your opinion on the availability of AR/VR devices in your school/campus?	Technology



Q4	What is your opinion on the availability of content and learning applications that are compatible with immersive technology in your school/campus?	Technology
Q5	Do teachers/lectures have basic computer skills? (typing, internet access, creating and editing files, etc.)	Human
Q6	Do teachers/lectures have basic internet access skills? (email, searching for information, downloading, etc.)	Human
Q7	Do students in your school/campus have basic computer skills? (typing, creating and editing files)	Human
Q8	Do students in your school/campus have basic internet access skills? (email, searching for information, downloading, etc.)	Human
Q9	Do teachers/lectures have knowledge related to immersive technology (Imtech)?	Human
Q10	How many teachers/lectures can use immersive technology devices (such as VR or AR)?	Human
Q11	How many teachers/lectures would be willing to use immersive technology (Imtech) in teaching?	Human
Q12	Do students have knowledge related to immersive technology (Imtech)?	Human
Q13	How many students in your school/campus have interacted with immersive technology (such as VR or AR)?	Human
Q14	Are students in your school/campus willing to use immersive technology in learning?	Human
Q15	Are students in your school/campus willing to use immersive technology in learning?	Human
Q16	According to you, can innovation in the use of immersive technology improve student engagement in learning?	Innovation
Q17	If the school/campus initiates the implementation of immersive technology in teaching, how do teachers/lectures and students respond, in your opinion?	Innovation
Q18	If there is access to utilize immersive technology in your school/campus, how do teachers and students adapt, according to you?	Innovation
Q19	Does the school/campus provide sufficient training support for teachers/lectures to develop innovative ideas related to immersive technology?	Self Development
Q20	Does your school/campus have funding sources for the utilization and implementation of technology-based learning, especially immersive technology?	Self Development
Q21	In the school board/education unit committee meetings, is there allocated time to discuss the utilization and budget support for the implementation of immersive technology in teaching?	Self Development

Source: Research data, 2023

The Likert scale utilized in the questionnaire, ranging from 1 to 5, aligns with the readiness index scale employed for evaluating e-Learning Readiness in this research. Therefore, there is no need for any data conversion.

In this research, the validity test employed includes both construct validity and content validity using expert judgment. Experts were asked for their opinions on the research instrument items, whether they were in line with the instrument's criteria and whether each statement represented the measured substance. The opinions and suggestions of these experts were used as a basis for refining the instrument. The analysis used in testing the construct validity of this research involved correlating the scores of each statement with the total scores of the items on the relevant variable using the product-moment correlation formula. Arikunto (2013) stated that data is considered valid when it aligns with the criteria, meaning there is congruence between the research data and the criteria.



Subsequently, the instrument used was tested for its reliability to ensure that the resulting data is usable and robust. Conceptually, reliability refers to the extent to which the results of a measuring instrument are consistent and free from measurement errors (Darma, 2021).

The reliability test in this study used the Cronbach's Alpha formula. After all the data was collected, an analysis was conducted using the ELR model by Aydin & Tasci

(2005). Once the assessment sheets were filled out by the respondents, the total scores were obtained, and the final average was calculated using the formula:

$$\text{Average} = \frac{\sum x}{n}$$

$\sum x$ = Sum of total scores

n = Number of respondents

Level 1	1 – 2.60	Not Ready, Need a lot of work
Level 2	2.61 – 3.40	Not Ready, Need some of work
Level 3	3.41 – 4.20	Ready, Need some of work
Level 4	4.21 – 5	Ready, Go ahead

The analysis was performed for each readiness factor, each item within the same factor, question construction, and the overall readiness level for a comprehensive overview.

Result and Discussion

The analysis was conducted based on questionnaires completed by 45 respondents. The 45 respondents were from educational institutions at the Elementary School, Junior High School/Vocational High School, Senior High School, Polytechnic, and University Levels. This educational institution has been a partner of SEAMOLEC and, over the past 2-3 years, has actively utilized immersive technology-based learning.

According to Sugiyono (2011), the criteria for testing the analysis of validity are expressed through the corrected item-total correlation method, with the following testing criteria: When the correlation coefficient value (r-value) of each item score with the total is greater than the critical value at a significant level (alpha – 0.05), with a data sample size of 45, then the critical value is 0.294. The rule is that if r-value > critical value, then the questionnaire is considered valid. However, if r-value < critical value, it can be stated that the distributed questionnaire is not valid. Based on the validity test results, all instrument items used in this study are valid, as evidenced by the r-value > critical value = 0.294. Therefore, it can be concluded that the data aligns with the actual conditions.

To determine whether the instrument used can be trusted as a data collection tool, the study will test reliability using the Cronbach's Alpha formula. The following are the results of the reliability test for the 4 readiness factors.

Table 2. Reliability test results

No	Factors	Cronbach Alpha	Keterangan
1	Technology	0.717	Reliabel
2	Human	0.894	Reliabel
3	Innovation	0.683	Reliabel
4	Self Development	0.808	Reliabel

Source: Research data, 2023



Based on the results of the Reliability test, it can be concluded that all factors used in this study are reliable. This finding is supported by the Cronbach's Alpha value, which is greater than the predetermined cutoff value of 0.6. Therefore, it can be stated that each question item from each variable is reliable, and consequently, the items in each indicator are deemed suitable for use as measurement tools.

Tabel 3. The readiness level of the technology

No	Questions	Value	Level Readiness
Q1	Is there internet access with a speed of 25 Mbps available in your school/campus environment?	4.02	Ready but Needs a few improvement
Q2	Are there computers/laptops with processors equivalent to Intel Core i5 or AMD Ryzen 5 and 8GB RAM available in your school/campus?	3.31	Not Ready, Needs some of work
Q3	What is your opinion on the availability of AR/VR devices in your school/campus?	2.82	Not Ready, Needs some of work
Q4	What is your opinion on the availability of content and learning applications that are compatible with immersive technology in your school/campus?	2.95	Not Ready, Needs some of work
Total		3.28	Not Ready, Needs some of work

The readiness level of the technology factor has an average score of 3.28, falling into the category of not ready and needing some work. Looking at the averages, the point on internet access availability has the highest average score of 4.02, indicating the availability of internet access with a speed of 25Mbps. Meanwhile, the lowest point is on the availability of AR/VR devices with an average score of 2.82. The availability of adequate devices is a crucial factor, considering that AR/VR devices are essential tools used in immersive technology-based learning. The lack or insufficiency of suitable AR/VR devices can pose difficulties for both teachers and students in accessing learning content, indicating a need for improvement in this aspect.

The human resources factor indicates the readiness level concerning aspects related to teachers/lectures and students. It will then be examined in terms of basic skills in computer use, internet access, knowledge related to immersive technology, experience in using AR/VR devices, and willingness to use immersive technology in learning.

Tabel 4. The readiness level of the human

No	Questions	Value	Level Readiness
Q5	Do teachers/lectures have basic computer skills? (typing, internet access, creating and editing files, etc.)	4.48	Ready, Go Ahead
Q6	Do teachers/lectures have basic internet access skills? (email, searching for information, downloading, etc.)	4.47	Ready, Go Ahead
Q7	Do students in your school/campus have basic computer skills? (typing, creating and editing files)	4.04	Ready but Needs a few improvement
Q8	Do students in your school/campus have basic internet access skills? (email, searching for information, downloading, etc.)	4.24	Ready, Go Ahead
Q9	Do teachers/lectures have knowledge related to immersive technology (Imtech)?	2.98	Ready but Needs a few improvement
Q10	How many teachers/lectures can use immersive technology devices (such as VR or AR)?	2.67	Ready but Needs a few improvement
Q11	How many teachers/lectures would be willing to use immersive technology (Imtech) in teaching?	3.29	Ready but Needs a few improvement



Q12	Do students have knowledge related to immersive technology (Imtech)?	2.49	Not Ready Needs a lot of work
Q13	How many students in your school/campus have interacted with immersive technology (such as VR or AR)?	2.40	Not Ready Needs a lot of work
Q14	Are students in your school/campus willing to use immersive technology in learning?	3.56	Ready but Needs a few improvement
Q15	Are students in your school/campus willing to use immersive technology in learning?	3.44	Ready but Needs a few improvement
Total		3.46	Ready but Needs a few improvement

The average score obtained from the human resources factor, at 3.46, indicates that in this regard, teachers/lectures and students are ready for the implementation of immersive technology in learning but require some improvement. The highest average score is for teachers/professors who already possess basic skills in computer use and internet access, categorizing them as ready. Areas that need significant improvement include students' knowledge of immersive technology and their experience with accessing or interacting with immersive technology in learning.

The innovation factor encompasses the perspectives of educational institutions in the utilization of immersive technology, where immersive technology can enhance student engagement in learning, initiate the implementation of immersive technology in education, and involve the adaptation of both teachers and students when access to immersive technology is available.

Tabel 5. The readiness level of the innovation

No	Questions	Value	Level Readiness
Q16	According to you, can innovation in the use of immersive technology improve student engagement in learning?	3.93	Ready but Needs a few improvement
Q17	If the school/campus initiates the implementation of immersive technology in teaching, how do teachers/lectures and students respond, in your opinion?	4.56	Ready, Go ahead
Q18	If there is access to utilize immersive technology in your school/campus, how do teachers and students adapt, according to you?	3.91	Ready but Needs a few improvement
Total		4.13	Ready but Needs a few improvement

This factor has the highest average score among others, which is 4.13, categorizing it as ready but requiring slight improvement. The highest point, at number 17, indicates that if the school/campus initiates the implementation of learning utilizing immersive technology, both teachers/lectures and students respond very positively



Tabel 6. The readiness level of the self development

No	Questions	Value	Level Readiness
Q19	Does the school/campus provide sufficient training support for teachers/professors to develop innovative ideas related to immersive technology?	3.89	Ready but Needs a few improvement
Q20	Does your school/campus have funding sources for the utilization and implementation of technology-based learning, especially immersive technology?	2.58	Not Ready Needs a lot of work
Q21	In the school board/education unit committee meetings, is there allocated time to discuss the utilization and budget support for the implementation of immersive technology in teaching?	2.64	Not Ready, Needs some of work
Total		3.04	Not Ready, Needs some of work

The self-development factor receives the lowest average score among other factors, which is 3.04. Overall, the self-development factor falls into the Not Ready category and requires significant improvement. There is a need for slight improvement in terms of training support for teachers/professors in developing innovative ideas related to immersive technology to reach the Ready category. Meanwhile, funding sources for addressing immersive technology in education require substantial improvement.

Tabel 7. The readiness level of 4 factors

No	Factors	Value	Status
1	Technology	3.28	Not Ready, Needs some of work
2	Human	3.46	Ready but Needs a few improvement
3	Innovation	4.13	Ready but Needs a few improvement
4	Self Development	3.04	Not Ready, Needs some of work

Based on the data, it can be observed that there is a slight improvement needed to reach the 'ready' category, particularly in the areas of technology and self-development. Meanwhile, human resources and innovation are already prepared and require only minor improvements.

Technology Factor, Human Factor, Innovation Factor, Self Development Factor	3.48	Ready but Needs a few improvement
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As for the overall results of the combination of these four factors, the conclusion is that the educational institution is Ready to implement learning using immersive technology, with only a slight need for improvement.

Conclusion and Suggestion

Based on the research findings and discussions on the readiness level of educational institutions in implementing immersive learning technologies, it can be concluded that educational units are at a prepared level but still require improvement. Among the four assessment factors, the primary areas for improvement are in the technology and self-development factors.

Regarding technology recommendations, schools or campuses planning to implement immersive learning with AR/VR technology should develop a well-thought-out implementation plan to address the limitations of AR/VR devices and immersive content. Not all lessons can be effectively implemented using immersive technology; therefore, content provision should align with the intended learning outcomes. The execution of immersive



learning can be carried out in small groups with limited time frames to overcome the constraints posed by the relatively expensive AR/VR devices, which are not widely available in educational institutions. Additionally, there is a need for the development of immersive content tailored to the learning objectives to achieve effective and goal-oriented learning.

In terms of self-development, schools or campuses should allocate budgetary resources and specific time for discussions on the implementation of immersive learning technologies. The hope is to increase or fulfill the need for AR/VR devices in schools/campuses and facilitate the provision of immersive learning content.

However, further research is needed on strategies for implementing immersive learning technologies to ensure that their adoption in educational institutions is not merely following technological trends or executing budgets without conducting feasibility studies or thorough planning. This is done to ensure that the expected benefits of implementation are maximized and not wasted

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