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Development of Integrated Online Course Learning (IOCL) Model to Improve Students' Literacy Skills in Digital Era 5.0

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Abstract: This study aims to develop and analyse the feasibility, practicality and effectiveness of Integrated Online Course Learning (IOCL) application in improving students' digital literacy skills. This research uses the Research and Development (RnD) method using the ADDIE model, namely analysis, design, development, implementation, and evaluation. The data collection techniques used were questionnaires, document checklists and tests in the form of descriptive quantitative data. The analysis technique used in this research is mixed data analysis technique. Based on the results of media expert validation, a value of 3.68 (92.18%) was obtained, which means very feasible, for the results of material expert validation obtained a value of 3.83 (95.71%) with a very feasible category, while the results of linguist validation obtained a value of 3.80 (95.00%) with a very feasible category. The practicality test of this product obtained a score of 94.64%, including in the category of very effective and practical to use. The results of the t-test showed a significant increase in students' digital literacy skills after receiving different treatments, namely using the IOCL Application. Based on the results of the t-test analysis of the average value of the control class 70.25 and the research class 87.50. Based on the data sig value. (2-tailed) or t-test p-value of 0.00 which means <0.05, it can be concluded that Ho is rejected and Ha is accepted. This shows: 1) This IOCL application has a positive influence on students' digital literacy skills, and 2) IOCL application has practicality, and effectiveness to be used as a learning model to improve students' digital literacy skills.

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Introduction

The development of learning models in Indonesia is a necessity that must continue to be reviewed seriously and continuously. In this digital 5.0 era, it is very important to adjust the learning model to the needs of students in schools both in urban and rural areas (Nilholm, 2020), (Andini et al., 2020). The development of the learning model must be comprehensive from elementary school to high school and college levels given the challenges of technology that are growing rapidly. Learning models in various parts of the world ranging from Asia, Africa, Europe, and America are very rapid, especially related to literacy and digital learning (Werse, 2023), (Anderson et al., 2018).

The problem that arises in Indonesia related to digital literacy and learning is that online learning or hybrid learning that prioritises digital literacy skills for students has not been fully integrated (Kumi-Yeboah et al., 2023), (Pakistyaningsih et al., 2019). Likewise, in terms of planning, implementation and evaluation carried out by teachers 72.5% are still

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manual (without a system) so that teachers have to work twice to transfer on-line learning outcomes into evaluations that are still manual (Afwan et al., 2020).

This research is based on many complaints from teachers in elementary schools to senior high schools related to the low digital literacy skills of students. In addition, teachers want to facilitate students to learn by means of courses but carried out on-line so that students get additional competencies and literacy related to digital literacy (Dahlström, 2022), (Smith & Storrs, 2023). Learning in the form of courses integrated in one system has not been widely developed, therefore this research wants to realise the learning atmosphere in an integrated, precise, measurable and in accordance with current technological needs (Richard & Giri, 2019), (Ricu Sidiq & Najuah, 2020).

Law No. 11 of 2019 concerning the National System of Science and Technology, the Indonesian government has provided a very broad space so that science and technology in education in Indonesia can become the basis for policy formulation and can increase the competitiveness and independence of the nation to become an advanced and quality nation (Mukminin et al., 2019), (Pletz & Zinn, 2020). Based on the results of preliminary research conducted in primary schools, middle schools and high schools, data were generated that: 1) 96.2% of schools do not have an integrated learning evaluation system, 2) 92.4% of teachers teach using different applications, making evaluation and follow-up difficult, 3) Collecting learning data and assignment portfolios is difficult to do manually, 4) There is no question validation system and answer keys that are synchronised with the material, 5) There is no integrated course system innovation for planning, implementation, and evaluation (Sajja et al., 2023), (Hedegaard-Soerensen & Penthin Grumloese, 2020).

Based on these problems can affect students' literacy skills in the 5.0 (Max et al., 2024), (Sharma & Yarlagadda, 2018), so that appropriate learning models and tools are needed to facilitate student learning activities to improve literacy skills in the digital era. It needs to be emphasized that the good and bad and the success of the learning process is seen from learning activities that are focused on students, so that students are able to be active in it both psychologically, cognitively and affectively (Yueh et al., 2020).

The purpose of this research is to develop an Integrated Online Course Learning (IOCL) application to improve students' digital literacy skills. The specific objectives are: 1) Creating a positive learning environment with educational learning support tools, 2) Improve students' competence and literacy skills that are still below standard, 3) Integrate the IOCL application with digital and literacy resources to facilitate active and effective learning (Zhang et al., 2023), (Hao & Gu, 2023). In order to realise active and effective learning based on digital literacy 5.0, the indicators developed in the preparation of the IOCL application are: 1) Students' happy mindset towards digital-based literacy, 2) Students are encouraged to be able to think coherently and deeply, 3) the ability to find and select information, 4) being able to collaborate, 5) having a strong understanding of the socio-cultural context 6) understanding electronic security, and 7) functional skills and 8) being able to evaluate the results of problem solving (Zubaidah et al., 2025), (Goode et al., 2020), (Esparza et al., 2019). The concept map chart is as shown below.

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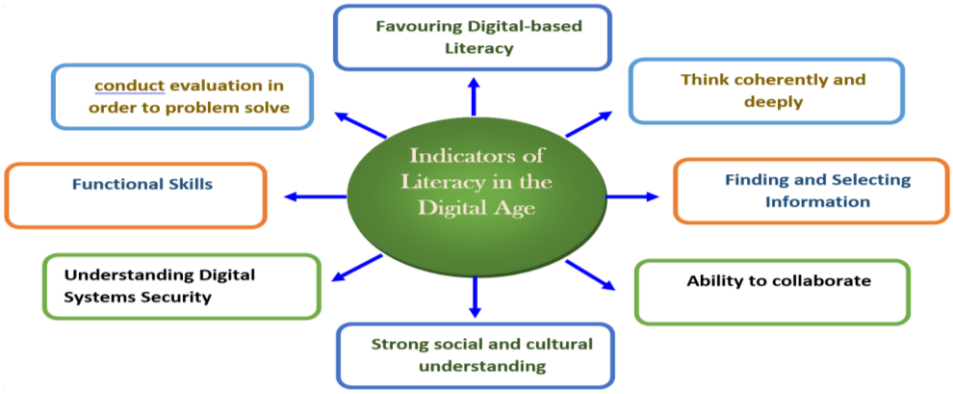

Figure 1. Indicators of Literacy Skills in the Digital Age
Source: (Gil Ruiz, 2024), (Max et al., 2024)

Based on this figure, it can be concluded that the literacy ability indicator consists of 8 elements which in general form students to be able to be literate in Digital Literacy and be able to think analytically in digital media. Students are expected to be able to identify systematic steps that will be taken to solve the problems they encounter when carrying out digital literacy activities and decision making based on the evaluation taken, students are able to make a decision on the problem faced according to the steps to solve it.

Previous research was conducted in this study as a research positioning. Some studies that have been conducted related to the development of digital-based learnings are: The Influence of Digital Literacy on the Development of Student Nationalism Insight (Firda Nurfauziyanti et al., 2022), (Lamada, Mustari. Rahman, 2015). However, there is no research that systemically and systematically designs the IOCL application model for students. Based on this, it can be conveyed that the urgency and novelty of this research is to take a new step in the form of an IOCL application related to the course planning system. With the IOCL application that is comprehensive / holistic will greatly help teachers, students and educational institutions to control the desired achievements and competencies set by the government and educational institutions. In addition, it can also improve students‘ digital literacy competencies because the references in the IOCL application have been designed to train students’ literacy skills in the digital era.

Research Method

This method of research is development research (Page et al., 2021) using the ADDIE model with the aim of developing a learning model application (Susantini et al., 2021), (Spatioti et al., 2022). There are five stages with the ADDIE Model, namely: 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation. (Giacumo & Breman, 2021) the stages of development are as shown below:

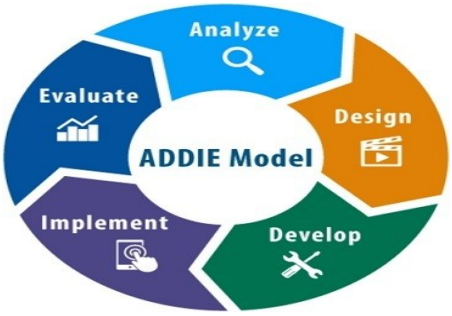

Figure 2. ADDIE Model Development.
Source: (Meilani Safitri, 2022)

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The technical steps for implementing the ADDIE Model are: 1) Analysis Stage, at this stage an in-depth theoretical and empirical study is carried out in accordance with the research variables to obtain input and evaluation of the formulation of the problems that have been determined. The data sources at this stage are obtained from research articles, observation documents and school documents, 2) Design stage, researchers plan to make product prototypes in the form of IOCL applications based on the results at the analysis stage. The resulting product is adjusted to the reference of the problem formulation that has been determined, 3) The development stage is to validate design experts, media experts, and content experts in two stages. experts used in accordance their respective expertise. 4) Implementation Stage, at this stage will conduct a phase I trial to students at school, namely at SDN Penanggungan, Trawas Regency, East Java Province. The phase I trial carried out was an individual trial with research subjects of 6 students, then continued the phase II test to 10 students. while the final test, namely phase III, was tested on 20 students to determine students' literacy skills towards the implementation of the IOCL Application, 5) The evaluation stage is carried out using a control class strategy and a research class to obtain comparative data that identifies the effectiveness of the IOCL Application in improving students' literacy skills in the digital era.

Primary data in this study were obtained from the results of questionnaires and observations to serve as the main data in solving the problem under study. While secondary data obtained from documentation in this study is used as a source of supporting data to assist researchers in solving problem formulations. The research location is SDN Penanggungan Trawas as a test site for the implementation of the IOCL Application. This study involved 20 students from grade IV.

The trial in this study consisted of two stages, namely feasibility testing and effectiveness testing of IOCL application products. The feasibility test was conducted through expert validity of the IOCL application. In this study, the feasibility test was calculated using a Likert scale test of 1 to 4 intervals with a score of 4 very feasible, a score of 3 feasible, a score of 2 not feasible, and a score of 1 very not feasible (Hernández-Sellés et al., 2020), (Setiawan & Fikri, 2022). The scores criteria table is as follows:

a) Validation was conducted to assess the validity of the product through questionnaires completed by expert validators in material, media and language; validation was carried out in the form of a questionnaire using a Likert scale:

Table 1. Validity Assessment

Qualification	Unit Value
Very Feasible	4
Feasible	3
Not Feasible	2
Not Very Feasible	1

The score can be calculated using the formula :

$$\text{Precentag} = \frac{\sum \text{skor x bobot komponen}}{n \text{ x skor tertinggi}} \text{ x } 100\%$$

After calculating the score value then the product is categorised as feasible if it meets the following qualifications:

Table 2. Expert validation eligibility categories

Eligibility Level	Qualification	Clarification
81-100	Very Feasible	No need for improvement
61-80	Feasible	Minor improvements
41-60	Feasible enough	moderate improvement

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21-40	Not Feasible	Major improvements
0-20	Not Very Feasible	Changed Total

If the product has a score of > 61 and has a qualification of Worthy or very Worthy according to the results of expert validation, the product is declared feasible / appropriate.

b) Student questionnaire results

After making improvements, the learning media was tested on fourth grade students of SDN Penanggungan Trawas. The questionnaire used a Guttman scale with 'Yes or No' as the answer.

Table 3. Guttman Scale Evaluation

Value	Clarification
1	Yes
0	No

The T-test will be used to find the standardised scores of the control and research classes. The results of this test will show how effective the IOCL application is in improving students' literacy skills in the digital era.

Results and Discussion

Feasibility of IOCL Application Product Development

This research uses the ADDIE model to develop the IOCL application. The implementation stage includes validation and verification of product feasibility by material, media, and language experts. The results of the evaluation of the feasibility of the IOCL application by media experts will be described as follows;

Results of Feasibility Test by Media Experts

Table 4. Results of Media Expert Assessment (Phase I and II)

No	Standard	Stage I Value	Percentage (%)	Feasibility Category	Stage II Value	Percentage (%)	Feasibility Category
1	Appropriateness of the appearance of the IOCL App	3,1	77,5	Feasible, needs minor improvements	4,0	100	Highly Feasible, no need for improvement
2	The photos are good and appropriate	3,2	80	Feasible, needs minor improvements	3,7	92,5	Highly Feasible, no need for improvement
3	Features/tools are easy to use and access	3,4	85	Highly Feasible, no need for improvement	4,0	100	Highly Feasible, no need for improvement
4	The media in the application is appropriate and easy to understand	2,3	57,5	Feasible, Moderate Improvement	3,8	95	Highly Feasible, no need for improvement
5	Colour contrasts are clear and attractive	2,2	55	Feasible, Moderate Improvement	3,4	85	Highly Feasible, no need for improvement
6	IOCL app is easy to use and simple	3,1	77,5	Feasible, needs minor improvements	3,6	90	Highly Feasible, no need for improvement

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7	IOCL app can upload students' literacy spirit	3,3	82,5	Highly Feasible, no need for improvement	3,7	92,5	Highly Feasible, no need for improvement
8	Use of illustrations relevant to the material	1,7	42,5	Not feasible, needs major repairs	3,3	82,5	Highly Feasible, no need for improvement
	Average value	**2,78**	**69,68**		**3,68**	**92,18**	

Based on the data above, it shows that media experts have an overall score at stage I of 69.68%, which indicates feasible, but the IOCL application needs revision because not all points are in the very feasible category, there are still 1 category that is considered by experts to be inappropriate and there are 2 categories that are still at a fairly feasible level and require improvement. This is because: 1) the use of illustrations is still very lacking and not relevant to the material, 2) interesting colour contrasts are still not clearly visible, and 3) the media in the application is not appropriate and still difficult to understand.

As the results of the evaluation in stage I, improvements were made as there was a significant change in the results of stage II from previously only obtaining a percentage value of 69.68% up to 92.18% overall. If at stage I there were still 3 low categories, namely points 4, 5 and 8, then at stage II there were no low eligibility scores. Of the 8 indicators in stage II that received very feasible scores, there were 8 indicators or 100%.

Based on table 1.4 above, the suggestions submitted by the expert have been adjusted so that in stage II the media expert gives an accumulated value of 92.18% which means it is Very Feasible and there is no need for improvement (Nurdyansyah, 2024), because the use of colour contrast illustrations and media used in the IOCL application has been added and adjusted to the material. The accumulative percentage value at stages I and II also increased by 22.5% which identified that the IOCL application was ready to be tested in the field.

Results of Feasibility by Material Experts

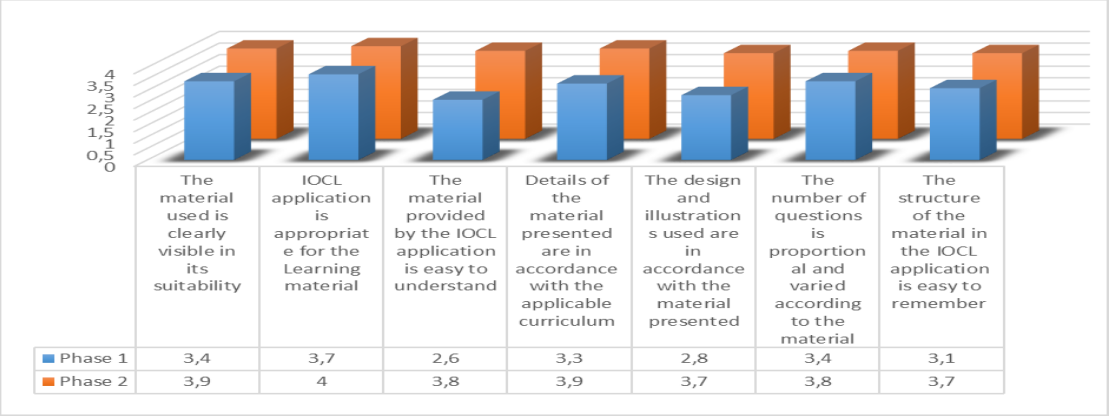

Figure 3. Results of Material Expert Validation Phase I & II

Based on the results of the material expert validation above, it shows that: in stage I, the average score of 7 indicators is 3.19 or 79.64%, which indicates that the material in IOCL is suitable for use with a note that there are minor improvements that must be made. There are two Points that get the lowest score at stage I, namely related to the material presented that is easy to understand (point 3) and the Design and Illustrations used in accordance with the material presented (Point 5). The highest score at stage I is on the second indicator, namely the IOCL application in accordance with the learning material.

Meanwhile, the results of the material expert validation in stage II showed that there was a significant improvement, reaching an average of 3.83 or 95.71%, an increase of

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16.07% from stage I. In stage II, the perfect score was obtained on points 1 and 2. In stage II, the perfect score was obtained at point 2, namely the IOCL application in accordance with the learning material with the caterogy of Very Feasible and no need for improvement. There are two lowest indicators in stage II, namely the 5th indicator, namely the design and illustrations used in accordance with the material presented and the 7th indicator, namely the structure of the material in the IOCL application is easy to remember, each getting a score of 3.7 or 92.50%.

Based on the above analysis, the results show that the material in the IOCL application is very feasible to be implemented and has met the requirements of the validity assessment criteria by material experts who reach a value of 3.83 or equivalent to 95.71% in stage II The material expert test is considered very feasible to be used for field tests at school.

Results of Feasibility Test by Linguists

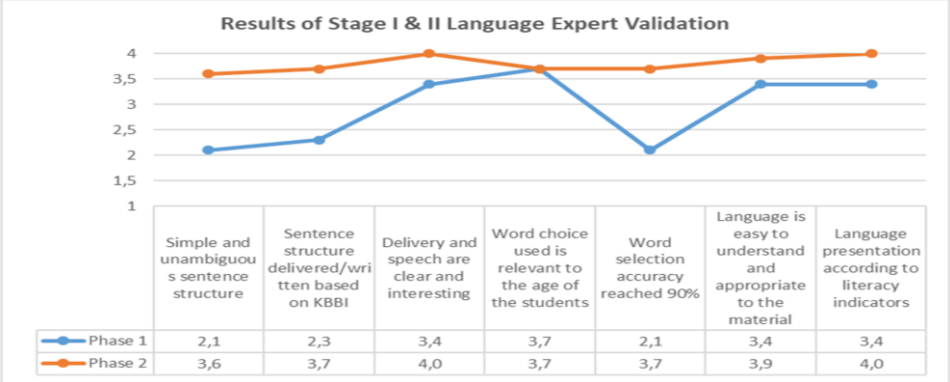

Figure 4. Results of Phase I and II linguist validity

Referring to the figure above, it can be seen that in stage I the average acquisition value is 2.91 or 72.86%, indicating that the language used in the IOCL application is feasible with a note that it needs improvement. The lowest result value of the 7 points that require improvement is 3 points, namely at the 1st point with the acquisition value of 2.1 (52.5%), the 2nd point with the acquisition value of 2.3 1 (57.5%), and at the 5th point which is 2.1 (52.5%). The highest score in the seven indicators of stage I is on the 4th point, the choice of words used is relevant to the age of the students, based on these results, improvements need to be made, namely: 1) improving the sentence structure so that the meaning is not ambiguous, 2) composing sentences based on KBBI to make it easier to understand and orderly, and 3) the choice of words must be considered so that it will create the impression of being easy and pleasant to read by students.

Based on the results of input by language experts, improvements and reassessments were made by experts at stage II. The results of the language expert validation at stage II are as follows: there is a significant improvement in the results at stage II, namely the acquisition of the accumulative average score from the linguist of 3.8 or 95.00%. There was an increase of 22.14% when compared to the results in stage I. Perfect scores were obtained by 2 indicators that received a score of 4, namely at point 3 and point 7, which are related to: 1) Language delivery and speech is clear and interesting and 2) Presentation of language according to literacy indicators. Based on the results of the linguist assessment above in accordance with the 7 categories, it can be concluded that the language used in the IOCL application is very feasible and does not need any improvement.

From all the average results of validation in stage II conducted by media experts (92.18%), material experts (95.71%), and linguists (95.00%) it can be concluded that: 1) the IOCL application meets the Very Feasible assessment standard as an assessment reference in

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the Expert validation eligibility category in table 1.2, 2) The IOCL application can be used for the next stage, namely field testing into learning practices at school.

Effectiveness of IOCL Application to improve Students' Literacy Skills in the Digital Age 5.0

Phase I Small Group Test

In the framework of fulfilling the practicality test of the IOCL application as the RnD research method with the ADDIE Model approach, a small group test will be conducted involving 6 students with high, medium, and low academic abilities in grade IV students of SDN Penanggungan Trawas. The results of the small group test assessment can be seen in Table 5.

Table 5. IOCL App Small Group Test Results

No	Aspects	s1	s2	s3	s4	s5	s6	Average	Criteria
1.	IOCL app gives a boost to students' literacy development	4	4	4	3	4	4	3,83	Very Feasible
2.	IOCL application based on interactive learning based on digital literacy.	3	4	4	4	4	4	3,83	Very Feasible
3.	Enjoyable IOCL Application Material	4	4	3	3	3	4	3,50	Very Feasible
4.	The IOCL app is very helpful in understanding the lessons.	4	4	4	4	4	4	4,00	Very Feasible
5.	The IOCL application has tools that are easy to use	3	4	4	4	4	4	3,83	Very Feasible
6.	IOCL Application material according to the applicable curriculum.	4	4	4	4	4	4	4,00	Very Feasible
7.	The display of the IOCL App is attractive	4	4	4	3	3	3	3,50	Very Feasible
	Total	3,71	4,00	3,86	3,57	3,71	3,86	**3,79**	Very Feasible
	Percentage							**94,64%**	

Based on the results of the Small Group Test in the table above, which was conducted to 6 students, the average score was 3.79 with a very feasible category. There are two lowest indicators, namely the 3rd and 7th indicators, each of which gets 3.50 points or 87.50% which states that: IOCL Application Material is fun and the IOCL Application Display is interesting. Based on table 1.6 above, overall, it identifies that the results of the small group test can be concluded that the IOCL application is very feasible and practical to use as a learning media to improve literacy skills with a percentage of 94.64%.

Phase II Advanced Test for 10 Students

In order to measure Phase II related to the effectiveness of the IOCL Application, an evaluation was conducted on 10 students. The assessment was carried out using the measurement of likes or dislikes on 5 indicators that have been determined by the researcher. The results of the phase II evaluation are as follows:

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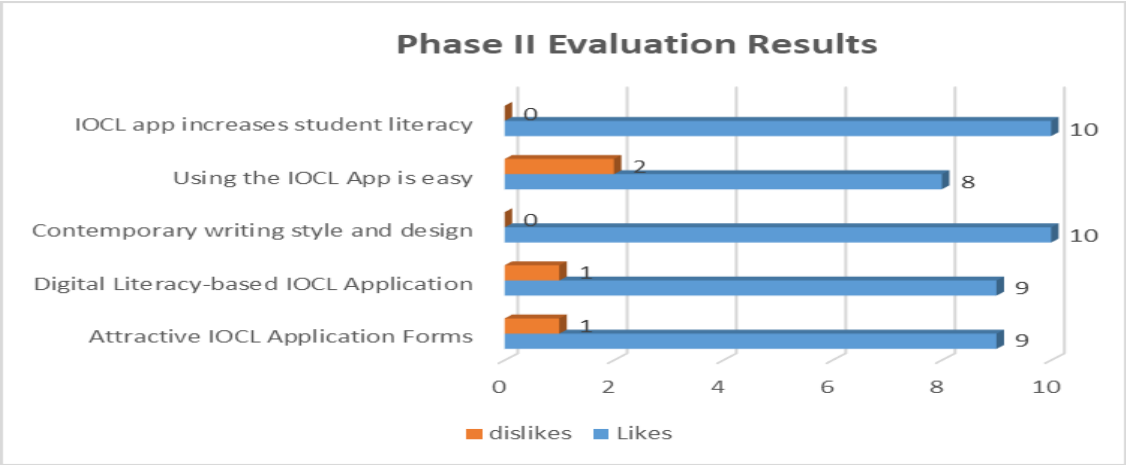
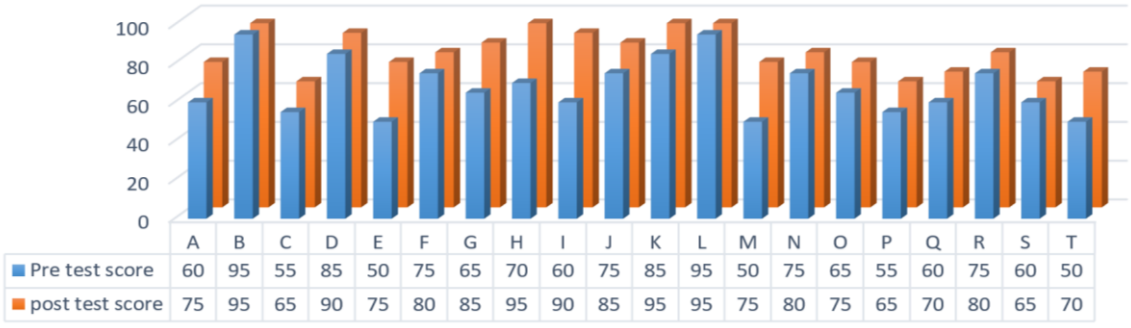


Figure 5. Phase II Evaluation Results

Based on the data from the evaluation results of phase II in Figure 1.5, it can be described that 92% of the 5 Indicators are liked / practical to be used by students both in terms of form, and writing style to attractiveness. The use of this IOCL application makes students more interested and gain experience to increase students' digital-based literacy. There are only 8% of students from 5 indicators who are not liked, as for this indicator, namely the use of the IOCL application for a small number of students is still unfamiliar so they feel there are still difficulties. Based on the results of the phase II evaluation above, it can be concluded that the IOCL Application is very practical and feasible to use in the learning process for students both in terms of form, attractiveness, writing style to the addition of literacy for students.

The results of the phase II evaluation above are in line with the results of the pre-test and post-test comparison as shown in figure 1.6 below:



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Pre test score	60	95	55	85	50	75	65	70	60	75	85	95	50	75	65	55	60	75	60	50
post test score	75	95	65	90	75	80	85	95	90	85	95	95	75	80	75	65	70	80	65	70

Average: Pre test = 68.5, Post test = 82.25, Increase = 13,75

Figure 6. Pre-test and post-test results

Based on the table above, the average value of the increase in students' digital literacy skills obtained from the comparison of the pre-test and post-test experienced a significant increase of 13.75%. This identifies that there is an increase in students' digital literacy skills after using the IOCL application. Based on the table above, it can also be analysed that 95% of students or 19 students experienced an increase in literacy skills ranging from 5% to the highest reaching 30%, it can be concluded that the number of students who experienced an increase in digital literacy skills using the IOCL application had a very high success rate.

Test Results of Control Class and Research Class

The Control Class and Research Class tests are needed to find out the differences in the results of students' digital literacy skills between classes that use the IOCL application

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and classes that do not use the IOCL application. The data analysis results are as in the following table:

Tabel 6. Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Kls-Crl	70.25	20	5.837	1.752
Kls-Rst	87.50	20	4.953	1.087

Tabel 7. Paired Samples Correlations

	N	Correlation	Sig.
Pair1 Kls-Crl Kls-Rst	20	.796	.000

Tabel 8. Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig.(2-tailed)
Pair 1 Kls-Crl Kls-Rst	-25.326	4.913	1.328	7.247	2.421	-16.483	22	.000

The scores of the control class and research class can clearly be seen in contrast to the standards in the table above. The control class score shows a result of 70.25, while the research class result is 87.50. As such, the p-value of the T-test statistic is 0.00 meaning (<0.05), thus indicating that Ho is rejected and Ha is accepted, meaning that there is a significant impact of the control class and research class.

The correlation level is 0.796 which identifies that there is a high correlation. The t-test data shows that the application of the IOCL application is able to improve students‘ digital literacy skills in the research class and has exceeded the KKM value set by the school which is 80. Based on the above data, it can be seen that the use of the IOCL application is acceptable and successful in improving students’ digital literacy skills.

Students' digital literacy skills will develop if more and more subjects are associated with digital-based tasks or accesses, besides the use of appropriate technology can help students to think analytically and critically to solve existing problems based on valid data. (Audrin & Audrin, 2022), (Tinmaz et al., 2022) The role of the teacher becomes very important to bring students close to technology and digital access that facilitates and helps students to learn effectively (Shopova, 2014).

IOCL applications can be used in the form of groups or individuals in the classroom, thus facilitating social interaction between students. This can increase student participation in the learning process and build collaboration between students. (Reddy et al., 2020) However, to achieve optimal results, it is necessary to consider other factors. Teaching methods, quality of materials, teacher-student interaction and the learning environment play an important role in enhancing students' creativity and literacy skills. This comprehensive approach ensures balanced development of digital skills. Therefore, educators must integrate all these aspects to achieve maximum results. Thus, the learning process becomes more effective and meaningful.

Conclusion

Based on the description and results of the discussion in this study, there are several conclusions that can be drawn, including:

1) The feasibility of the IOCL application was assessed as very feasible based on trials by experts. The evaluation results showed media expert validity (92.18%), material

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expert validity (95.71%), and language expert validation (95.00%). This shows that this application is very valid and can be tested for the practicality and effectiveness stages of the product.

2) Practicality The IOCL application is also considered practical for use in learning. The results of the small group trial of 6 students showed a practicality score of 94.64%. This shows that this application is easy to use and effective as a learning media.
3) The effectiveness of the IOCL App can be seen from the results of the t-test analysis which shows that the IOCL App is effective in improving students' digital literacy skills. The average value of the control class is 70.25 while the average of the research class is 87.50 there is a difference of 17.25 points. This difference can be concluded to be very significant (p-value <0.05), indicating that the IOCL application has a positive influence. therefore, the IOCL application can be said to be effective for improving students' digital literacy skills.

Recommendation

For teachers: 1) Teachers are expected to follow various technological developments, especially those related to digital learning technology from the process to the out come, 2) Teachers can develop teaching skills using digital technology that helps the teaching process to be carried out effectively and efficiently according to the target.
For Researchers: 1) Can expand the results of this research study for the development of effective learning, 2) dConduct further research on the development of integrated learning applications to improve other skills in this digital era.

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