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Exploration of the Independent Curriculum: Information Technology Collaboration in Multidisciplinary Learning in Situbondo Regency Elementary Schools

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ABSTRACT

Curricula serve as structured learning guides, framing students' educational journeys from inception to completion. In response to evolving science and technology, curricula must adapt to maintain engagement and relevance. This study investigates challenges in implementing independent curricula, particularly the preparedness of teachers to adopt innovative teaching approaches. A qualitative descriptive approach was utilized, emphasizing detailed narratives over numerical data. Data were collected through direct observations, interviews, and documentation. The analysis followed Miles and Huberman's framework, encompassing data reduction, data presentation, and conclusion drawing. Findings revealed that the primary challenge in implementing an independent curriculum lies in ensuring teachers possess the necessary competencies and support. Effective implementation requires training in interactive teaching methodologies, a thorough understanding of curriculum applications, and the ability to assess student achievements comprehensively. The study highlights a critical need for capacity building among educators to bridge the gap between curriculum design and classroom application. Addressing these challenges involves targeted teacher training programs, resource allocation, and consistent institutional support to facilitate a seamless transition. The successful implementation of independent curricula hinges on equipping teachers with the required skills and resources. Future efforts should focus on developing professional development frameworks to ensure sustainable and effective curriculum adaptation.

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1. INTRODUCTION

The curriculum functions as a foundational framework within educational systems, charting the trajectory of students' learning experiences from initiation to completion (Jensen et al., 2018; Suryati &

Jalinus, 2023). As the cornerstone of education, it serves as a comprehensive guide, ensuring that the learning process aligns with pedagogical goals (Admiraal et al., 2019; Pramesworo et al., 2023). A well-designed curriculum is dynamic and responsive, evolving to reflect contemporary advancements while addressing the diverse needs and contexts of students (Hardiansyah & Zainuddin, 2022; Noroozi et al., 2019). Without such adaptability, learning risks becoming stagnant, failing to prepare students for an ever-changing world driven by advancements in science and technology.

The transition from traditional to modern educational environments exemplifies this evolution. For instance, while the 1990s relied heavily on typewriters and rudimentary computer skills, today's students are immersed in a technology-rich world, often mastering digital tools at an early age. This shift has expanded career aspirations far beyond conventional professions, with students envisioning futures as illustrators, animators, game developers, and content creators.

To meet these changing aspirations, the curriculum must be continually refined to nurture competencies that empower students to thrive in a rapidly advancing era. As Ki Hajar Dewantara emphasized, education is about guiding children's innate potential to achieve well-being and fulfillment, both individually and as members of society (Aarnio et al., 2021; Hardiansyah et al., 2023). This principle underscores the importance of an adaptive curriculum in preparing students for a future that demands innovation, flexibility, and forward-looking perspectives.

The curriculum framework for basic and secondary education consists of two main components: intracurricular learning and projects designed to enhance the Pancasila student profile. Intracurricular learning activities are focused on achieving the specified learning outcomes for each subject. Meanwhile, projects aimed at enhancing the Pancasila student profile are designed to strengthen efforts aligned with the Graduate Competency Standards, ensuring that students embody the desired competencies and values (Ajakaye & Ogunniyi, 2021; Aliyyah, Gunadi, Sutisnawati, & Febriantina, 2023). The government determines the annual study load for each subject in terms of Lesson Hours (JP), while educational units are given the flexibility to manage weekly allocations of time across the academic year.

Educational units integrate local content reflecting regional characteristics, as mandated by regional administrations. They may also include supplementary content tailored to their specific needs in one of three ways: integrating it into other subjects, embedding it within project themes aimed at enhancing the Pancasila student profile, or developing independent subjects (Fransiska, Dumiyati, Mariam, Hikmah, & Haris, 2023; Qolbiyah & Ismail, 2022). The SD/MI curriculum (or its equivalent) is structured into three developmental phases: Phase A for grades I and II, Phase B for grades III and IV, and Phase C for grades V and VI. Content can be delivered using either a subject-based or a thematic approach.

The total study load for SD/MI or equivalent institutions is divided into two key components: intracurricular learning and projects focused on developing the Pancasila student profile. Notably, projects aimed at achieving this profile comprise approximately 20% of the total annual study load, ensuring significant attention is given to this critical aspect of student development (Aini, 2023; Calvari, 2024).

The execution of the initiative to enhance the profile of Pancasila students is conducted with flexibility regarding both content and timing of implementation. The project must address the accomplishments of the Pancasila student profile relevant to the student's developmental stage, without necessitating a connection to academic successes in the subject matter. The project's implementation time management can be achieved by aggregating the lesson hours allocated to enhance the Pancasila student profile across all subjects, with the total implementation time for each project not required to be uniform (Ruaya, Kang, Reader, & Hidayat, 2022).

This research addresses a critical gap in the integration of digital technology into the Independent Curriculum, particularly in the context of rural and local educational settings like Situbondo Regency. While existing frameworks and platforms, such as Merdeka Mengajar and the Education Report Card, have shown potential in advancing educational innovations, there is limited evidence on how these

tools can be effectively implemented at the grassroots level to support the Freedom of Learning initiative. The novelty of this study lies in its collaborative approach, uniting educators, driving schools, and regional stakeholders to develop and disseminate practical strategies for integrating e-learning technology into daily educational practices.

The primary aim of this research is to empower educators as key agents of change by equipping them with the skills and tools to utilize digital platforms effectively. By fostering partnerships with educational institutions, the Education Office, and UPT, this study seeks to enhance the dissemination of information technology, optimize school administration, and implement innovative teaching methods. The initiative will also explore the scalability of these solutions to address broader challenges in achieving the Pancasila student profile and supporting independent, technology-enabled learning.

This research is significant in its potential to transform educational practices, particularly in underserved regions. By leveraging technology and building local capacity, it contributes to a more inclusive, adaptive, and student-centered education system. Furthermore, this project serves as a model for addressing the post-pandemic acceleration of digital adoption in education, ensuring that technological advancements are accessible, sustainable, and aligned with Indonesia's broader educational goals. The outcomes will provide valuable insights for policymakers and educators alike, paving the way for a more innovative and equitable education system.

2. METHODS

This research employs a qualitative descriptive approach, which focuses on understanding phenomena through detailed descriptions in words and language, rather than numerical data (Trisdiono et al., 2019; Moleong, 2019). Qualitative research is particularly suited to exploring the lived experiences of research subjects, capturing their perspectives through interviews, observations, and other forms of descriptive data. The aim of descriptive research is to create systematic, factual and accurate descriptions of the facts and characteristics of a particular population or area. This research was used to find out how the implementation of the independent curriculum in various multidisciplinary sciences was implemented in various schools in Situbondo Regency. In this research, the primary data source is in the form of statements obtained from interviews with predetermined informants which cover various matters related to the implementation of independent curriculum-based learning.

In terms of collecting this data, the researcher goes directly to the research object to obtain valid data, so the researcher uses the following method: Observation Method, Interview Method (Interview), Documentation method. The validity of the data in this research was determined using credibility criteria. To obtain relevant data, the researcher checks the validity of the research data by: 1) Extended Observation, the researcher stays in the research field until data collection saturation is reached. Extending the researcher's observations will allow increasing the degree of confidence in the data collected. By extending this observation, the researcher checks again whether the data that has been provided so far after being checked again at the original data source or other data sources turns out to be incorrect, then the researcher carries out another wider and deeper observation so that data is obtained that is definitely correct; 2) Diligence in observation. Increasing perseverance means carrying out observations more carefully and continuously. In this way, the certainty of data and sequence of events can be recorded definitely and systematically; 3) Triangulation, Triangulation in credibility testing is defined as checking data from various sources in various ways, and at various times. This research uses source triangulation. Source triangulation is used to check data regarding its validity, comparing interview results with the contents of a document by utilizing various sources of information data as consideration. In this case the researcher compares the observation data with the result data.

The data analysis used is descriptive-analytical, describing the data collected in words and images, not numbers. Data originating from manuscripts, interviews, field notes, documents, and so on is then

described so that it can provide clarity on the facts or realities. According to Miles and Huberman, there are three lines of activity, namely data reduction, data presentation, and drawing conclusions or verification. Reduction is carried out from data collection, starting with summarizing, coding, tracing themes, writing memos, and so on, with the aim of eliminating irrelevant data or information, and then verifying the data. Qualitative data is presented in the form of narrative text, with the aim of combining information that is arranged in a coherent and easy to understand form. Researchers must arrive at conclusions and carry out verification, both in terms of meaning and the truth of the conclusions agreed upon by the place where the research was carried out. The meaning that researchers formulate from data must be tested for truth, suitability, and robustness. Researchers must realize that in searching for meaning, they must use an emic approach from an information center and not an interpretation of meaning according to the researcher's view (ethical view).

3. FINDINGS AND DISCUSSION

3.1 Findings

The synergy of technology integration in the education curriculum is a vital and urgent step, especially in implementing the independent curriculum, which is currently being intensively implemented in Indonesia. The importance of this integration can be seen from the fact that children from an early age have been accustomed to using gadgets, often without adequate supervision. Therefore, schools are essential as the main space for character building. Through a well-designed learning system, schools can be an ideal place to develop positive characters in utilizing technology effectively and responsibly. Data from the Central Statistics Agency (BPS) of the Republic of Indonesia shows that there are 45.3 million students divided into 25.49 million in elementary schools, 10.13 million in junior high schools, 4.78 million in senior high schools, and 4.9 million in vocational schools. These figures underline the importance of a well-designed curriculum in educating the younger generation. An innovative and technology-adaptive curriculum will help inform the nation's children and shape students to be responsible and skilled in the digital era.

Data and information that have been collected from observations, interviews, and documentation on learning community activities are then processed into several forms of data analysis, based on the problem to be solved. The problem formulation is efforts to disseminate and increase the use of technology to support the implementation of the Independent Curriculum in Situbondo Regency. The analysis procedure uses data analysis and technical triangulation (interviews, observation and documentation) and source triangulation (principals, supervisors and teachers) with the aim of obtaining valid, reliable and credible information. The following is the availability of resources in implementing learning communities.

Table 1. lists the participants involved in the learning community in Situbondo Regency, illustrating the diversity of roles and schools represented

NO	NAME	POSITION	SCHOOL
1	Agus Sediono, S.Pd	Principal	SDN 1 Sumberanyar
2	Devi Widiyanti, S.Pd	Teacher	SDN 1 Sumberanyar
3	Suwarni, S.Pd	Teacher	SDN 1 Sumberanyar
4	Imam Muzenni, S.Pd	Teacher	SDN 1 Alasmalang
5	Nur Farida, S.Pd.,M.Pd	Principal	SDN 1 Alasmalang
6	Ferdian Emeiliyawati, S.Pd	Teacher	SDN 1 Alasmalang
7	Titin Andayaningrum, S.Pd	Principal	SDN 3 Banyuputih
8	Erlin S.Pd	Teacher	SDN 3 Banyuputih
9	Suryaningsih, S.Pd,SD	Teacher	SDN 3 Banyuputih
10	Desi Arisandi, S.Pd	Teacher	SDN 4 Sumberkolak
11	Sri Rejeki, S.Sd	Principal	SDN 4 Sumberkolak
12	Hendra Prayitno, S.Pd	Teacher	SDN 4 Sumberkolak

13	Nurjanna Syafitri S.Pd	Teacher	SDN 4 Sumberwaru
14	Hosnan Fudaily S.Pd	Teacher	SDN 4 Sumberwaru
15	Cicik Suhartini, S.Pd	Principal	SDN 4 Sumberwaru
16	Mudiarti, S.Pd.,M.Pd	School Supervisor	Kecamatan Banuputih
17	Yon Dirianto M.Pd	School Supervisor	Kecamatan Banuputih

Based on Table 1, the criteria for the teacher community, school principals, and school supervisors in Situbondo as data sources are teachers and school principals who have participated in and graduated from the teacher motivator or teacher facilitator training process held by the Ministry of Education. Exploration of technology integration, review of various information technologies that can be integrated in multidisciplinary learning. Several identified interactive learning applications or online platforms as learning aids that can support the Independent Curriculum, namely SIMPKB and Platform Merdeka Mengajar (PMM). Identify learning models, adapt learning models that can be collaborated and integrated multidisciplinary with the Independent Curriculum approach, namely project based learning (PJBL) and problem based learning. Teacher training and development, training and support for teachers in integrating information technology in multidisciplinary learning in order to expand understanding of the Independent Curriculum and the best ways to optimize this technology. Measurement and evaluation, determining performance indicators to measure the success of implementing the learning model approach. Then, periodic evaluations are carried out, which will help improve the approach used. Collaboration and curriculum development, involving stakeholders, such as parents, students and the school community, in the development and refinement of the Independent Curriculum that utilizes information technology.

Technology is vital in implementing the school curriculum and has an enormous impact. With the presence of technology, the curriculum can develop into something limitless, and creative innovation can be applied more effectively to bring new and exciting experiences for both parties, both teachers and students, especially in the implementation of the independent curriculum, which gives students the freedom to choose subjects according to their interests. The role of technology in the independent curriculum allows students to explore their interests and talents more freely. In addition, technology also will enable students to understand better the preparation needed for their future. Students can provide various perspectives and ideas that are in their minds, and teachers can direct them according to a curriculum that has been well-designed. Technology is a learning tool and a catalyst for developing a more dynamic and relevant curriculum to students' needs. The integration of technology into the curriculum provides space for creativity, innovation, and deeper understanding, all of which can contribute to the formation of a generation that is better prepared for the future.

Technology fosters active collaboration among students by enabling them to work together on challenging team projects through online platforms and collaboration tools. These tools encourage students to communicate effectively, share ideas, and contribute to the success of their groups, promoting essential teamwork skills with long-term benefits for both academic pursuits and future careers (Yaumi, 2019). Additionally, technology enhances access to diverse learning resources and methods, such as e-books, videos, and interactive simulations, which significantly improve student achievement. Teachers also benefit from technology by providing faster and more precise feedback, helping students identify and develop their abilities.

Beyond academics, technology supports students' personal development by equipping them with critical digital skills necessary in today's digital society. It teaches them to become responsible and ethical users of online resources, fostering their ability to navigate digital environments effectively (Daud, A., Aulia, A. F., & Ramayanti, 2019). Despite these positive impacts, the integration of technology in education comes with challenges, particularly the digital divide. Unequal access to devices and reliable internet connectivity can limit some students' ability to benefit fully from technological advancements in education.

Efforts to address this divide are essential to ensure equitable access to the benefits of technology integration. By doing so, all students can acquire critical skills such as creativity, critical thinking, and

collaboration, which are vital for success in the modern era. While technology significantly enhances academic achievement and personal development, bridging the digital divide remains a crucial priority to make these benefits universally accessible.

Based on the observations made, research results were obtained, namely that the development of learning communities between teachers within schools and outside schools can increase teacher understanding and build a culture of sustainable learning. Basically, everything related to teacher development has a big influence on improving the quality of student learning. Following are some results from the learning community analysis.

Table 2. Results of Reflections on the Implementation of Information Technology Collaborative Research in Multidisciplinary Learning

No	Name	Position	Analysis Results
1	Agus Sediono, S.Pd Devi Widiyanti, S.Pd Suwarni, S.Pd Imam Muzenni, S.Pd	Principal of SDN 1 Sumberanyar Teacher Teacher Teacher	Teachers and school principals have taken real action. The target of achieving 100 percent program implementation, however, there are obstacles faced by school principals, namely that teachers' IT mastery is still around 50%. 50% of teachers who understand IT are school supervisors who have not been able to join in any joint learning activities at school because the supervisor in question has the task of monitoring and evaluating. Real action was carried out by the teacher by providing guidance to fellow teachers at SDN 1 Sumberanyar by providing material and examples of good practices at school. The principal provides assistance and monitoring and evaluation to teachers who have received information from the teacher whether it has been implemented or not. And continuous learning, mainly based on information technology, is always carried out.
2	Nur Farida, S.Pd.,M.Pd Ferdian Emeiliyawati, S.Pd	Principal of SDN 1 Alasmalang Teacher	The principal prepares a real action plan with the teacher through learning community activities which are carried out every 2 weeks, but several activities cannot be attended by the supervisor because the supervisor has retired from duty. School principals and teachers try to create a learning community by preparing programs and discussing obstacles encountered when implementing the program. encouragement related to real actions carried out by fellow teachers. The theme of the encouragement is in accordance with what the teacher's obstacles are. The school principal has prepared concrete actions in accordance with school activities which are priorities for program implementation. Improving the quality of schools through differentiated learning processes is always a theme of discussion in learning communities. Real action is carried out by teachers who collaborate with the school principal regarding what is a priority

			for discussion. Teachers also inform fellow teachers at school regarding several developments in information technology, both on the independent teaching platform and other platforms.
3	Titin Andayaningrum, S.Pd	Principal of SDN 3 Banyuputih	Real action was carried out by the class 1 teacher using word guessing in choosing learning media so that students became interested in participating in class learning. Inspection has been carried out well providing information on good practices to several schools carried out by school principals and teachers. collaboration was carried out with the learning community by carrying out good practices in class by creating learning media in the form of snakes and ladders learning media in mathematics subjects in class 4 by class teacher Hj Erlin. Real action was carried out by the class 1 teacher using word guessing in choosing learning media so that students became interested in taking part in classroom learning. Inspection has been carried out well, providing information on good practices to several schools carried out by school principals and teachers during KKG and K3S activities.
	Erlin, S.Pd	Teacher	
	Suryaningsih, S.Pd. SD	Teacher	
	Desi Arisandi, S.Pd	Teacher	
4	Sri Rejeki, S.Pd	Principal of SDN 4 Sumberkolak	The development of the learning community at SDN 4 Sumberkolak focuses on analyzing educational reports, especially improving the quality of human resources. Improving the quality of human resources through developing IT-based learning processes. The involvement of teachers at schools in learning communities is carried out every weekend with a duration of 2 hours led by the school principal. Assistance is provided periodically to class teachers in preparing KOSP, differentiated learning processes, using IT and preparing modules and uploading real actions. teachers carry out learning communities in schools on a scheduled basis by discussing the latest school development issues such as, uploading real actions, differentiated teaching and learning modules according to plans. The principal routinely supervises class teachers whether the learning process is going well and how teachers arrange teaching modules accordingly. provisions in the curriculum
	Hendra Prayitno, S.Pd	Teacher	
	Nurjanna Syafitri S.Pd	Teacher	
	Hosnan Fudaily S.Pd	Teacher	
5	Cicik Suhartini, S.Pd	Principal Of SDN 4 Sumberwaru	Real action has been taken by teachers and school principals. The target of achieving 100 percent program implementation, however, there are obstacles faced by school principals, namely that teachers' IT mastery is still around 50%. 50% of teachers who understand

			IT are school supervisors who have not been able to join in any joint learning activities at school because the supervisor in question has the task of monitoring and evaluating. Real action was carried out by the teacher by providing guidance to fellow teachers at SDN 1 Sumberanyar by providing material and examples of good practices at school. The principal provides assistance and monitoring and evaluation to teachers who have received information from the teacher whether it has been implemented or not. And continuous learning, mainly based on information technology, is always carried out.
6	Mudiarti, S.Pd.,M.Pd Yon Dirianto, M.Pd	School Supervior Kecamatan Banyuputih School Supervior Kecamatan Panarukan	The central government, through the education office, has issued a policy that every teacher, school principal and supervisor is required to carry out reports that are included in employee performance targets (SKP). So the education service advises that all teachers, supervisors, school principals and teaching staff are required to be able to use information technology to support SKP. The report takes the form of a learning process that improves the quality of student learning.

3.2 Discussion

Various national and international studies have found that Indonesia is experiencing a crisis in sustainable learning. These studies show that information technology collaboration in implementing their curriculum is effective. These findings also underscore substantial educational disparities in Indonesia between regions and social groups. After that, the Covid-19 pandemic outbreak made things worse. To solve this and other problems, structural changes are needed, one of which is by revising the curriculum. The curriculum determines the topics covered in class. The curriculum also has an impact on the teaching techniques teachers use to meet the needs of their students. Therefore, the government has developed a Curriculum as an important part of its initiative to learn from the prolonged crisis we are currently experiencing.

An independent curriculum is a curriculum with several opportunities for extracurricular learning, whose subject matter is better suited to giving students time to explore ideas and develop competencies. Teachers can choose from a number of teaching tools to tailor lessons to student interests and learning needs. The project was created to increase the achievement of Pancasila's profile based on several themes set by the government. Projects are not connected to courses because they are not intended to meet specific learning objectives. The Merdeka Curriculum presents the Strengthening the Pancasila Student Profile (P5) Project which aims to provide opportunities for students to learn in a fun and flexible way, as well as develop various competencies needed in the Pancasila student profile (Comiskey, McKane, Jaffrey, Wilson, & Mordue, 2017; Janssen et al., 2018; Renguette, 2016). This project provides opportunities for students to gain knowledge through interactive activities and involving the surrounding environment. This activity aims to increase students' potential in investigation, problem solving and decision making.

In addition, through a positive school culture, this project aims to create an atmosphere that supports the cultivation and improvement of mutual cooperation behavior and creativity in

students. By involving all parties, namely students, schools and parents, an atmosphere that supports the Pancasila student profile can be created. By having an attitude that is in line with the Pancasila student profile, students are expected to be able to implement these values in their daily activities. It is hoped that this will help them become Indonesian citizens with character in accordance with the values contained in each of the principles in Pancasila (Kauppi, Muukkonen, Suorsa, & Takala, 2020). One of the learning principles in the Independent Curriculum is differentiated learning. Differentiated learning is learning steps that are modified according to the circumstances, needs and differences of each individual while still providing the same educational rights (Hero & Lindfors, 2019).

Differentiated learning requires teachers to understand students' differences in order to develop the potential of each individual. This is in line with Ki Hajar Dewantara's educational views, which state that education can provide guidance so that children's intelligence can achieve happiness and safety as individuals and members of society. The learning process not only contains the relationship between teachers and students, but also the relationship between students and learning media. Learning media is a device that can help students that contains learning materials that are used to understand concepts and be able to operate them themselves (Hardiansyah & Wahdian, 2023; Heikkinen & Räisänen, 2018). The level of effectiveness of the learning media used will increase if the teacher has the potential to facilitate and use it. Technological developments in the 21st century have become an unavoidable force in human life. This power has the potential to provide great benefits, but it can also pose risks that you should be aware of. Technology must be used wisely so that it can provide benefits in developing personal potential (Fleischmann & Daniel, 2013). The emergence of various information technology tools such as smartphones, laptops and computers marks the progress of information and communication technology. This technological development certainly has an impact on learning activities in schools, including the development of learning media.

The implementation of the independent curriculum is based on the results of interviews with several teachers and supervisors who carried out observations on the learning community in accordance with the mapping carried out. Learning communities become a forum for realizing collaboration between educators, minimizing gaps in competence between educators. The learning community was formed with the aim of school supervisors, school principals and educators having competence in building a sustainable shared learning culture through learning communities, so that it has an impact on improving student learning outcomes (Lopes et al., 2022). In a learning community, a group of educators and education personnel in one school study together and collaborate regularly with clear and measurable goals to improve the quality of learning so that it has an impact on student learning outcomes. So, it is hoped that it can increase the competence of educators and build a culture of sustainable learning.

This is done usefully as a medium for communication between teachers inside the school, communication between teachers outside the school, online communication through the official application from the Ministry of Education and Culture, namely the Independent Teaching Platform. Learning communities have 3 types, namely 1) learning communities within schools, 2) learning communities between schools, 3) online learning communities. The role of the learning community consists of, 1) facilitating joint learning regarding the Independent Curriculum, 2) Facilitating discussions to solve problems surrounding the Independent Curriculum, 3) Facilitating the process of sharing good practices with colleagues regarding the implementation of the Independent Curriculum, 4) Facilitating reflection on peer learning.

The Role Of Information Technology In Multidisciplinary Learning

Current issues that we often hear about, for example, environmental issues, technology will not replace teachers because of the sophistication of technology. However, technology in the hands of teachers will make things easier, not more difficult. the second is greater independence. The development of great character and competence will be transformational in all activities, especially in the world for students, which means that the Pancasila learning profile is relevant, learning is very

helpful for students. So technological developments feel complicated and require time according to interests, talents and those in the Merdeka Belajar curriculum. The existence of technological innovation in the free-to-learn curriculum in the digital era for teachers remains a form of freedom for teachers, namely teachers who teach in learning. It is made easier for teachers. Everything becomes practically easier and learning even though they are already teaching, that is, according to the stage of achievement and development of students. Apart from that, various platforms are developing and becoming independent for schools, namely teachers can continue to develop technology which is currently provided by the Ministry of Education and Culture and is technology-based such as the Merdeka Mandiri platform, and education will not be separated from the development of curriculum management and teaching educational report cards.

The Independent Learning Curriculum facilitates the development of cutting-edge information technology skills among students by offering the freedom to learn anytime and anywhere. This flexibility enables learners to utilize a variety of resources, particularly during challenging periods such as the COVID-19 pandemic. The curriculum encourages the adoption of diverse learning methods, including the use of digital technology, to address these challenges effectively. As part of its digitalization efforts, the Ministry of Education and Culture has introduced the *Belajar.id* learning account, a tool that not only supports independent learning but also fosters a shift in thinking, learning, and resource-access paradigms. Through this initiative, students are encouraged to access a wide range of digital learning materials to enhance their educational experience.

The Independent Learning Curriculum also aligns with the advancements of the Industrial Revolution 4.0 by integrating technology into learning processes. The COVID-19 pandemic, while disruptive, served as a pivotal moment for curriculum reform, highlighting the need for widespread adoption of technology in education. This shift underscored the importance of equipping students and educators with the skills required to navigate an increasingly digital world. While technological progress had already reached advanced stages prior to the pandemic, its benefits had been limited to certain groups. The pandemic acted as a catalyst, accelerating the need for curriculum changes to democratize access to these advancements.

One of the key strengths of the Independent Learning Curriculum, as noted by educators, is the inclusion of the Project for Strengthening the Pancasila Student Profile (P5). This initiative encourages students to go beyond traditional classroom learning by engaging in hands-on projects, providing opportunities to apply their knowledge in practical contexts. This approach not only supports holistic student development but also ensures that learning is dynamic, interactive, and aligned with real-world demands.

In implementing ICT-based learning media, the teacher said that before implementing the Independent Curriculum, when he was still using the emergency curriculum during the COVID-19 pandemic, he had used Google Forms, Google Meet and video calls via WhatsApp. After the implementation of the Independent Curriculum, the application was rarely used because school regulations prohibited students from carrying smartphones. The use of learning media based on information and communication technology after the implementation of the Independent Curriculum is more often classical with the use of power points or other learning media based on games which are displayed using an LCD projector and students progress in turns. Students admitted that it was easier to master material presented in PowerPoint form. However, PowerPoint media is not used in all subjects, according to students, PowerPoint is more often used in arts and culture subjects. Students said that the application of ICT-based learning media made learning activities feel fun and not boring. The type of learning media that is popular with students is game-based learning media, this is directly proportional to the statement from the class IV A teacher that when students were asked what they wanted to use for learning, the students said they wanted to use games in games. According to the class IV A teacher, this was a result of the Covid-19 pandemic which resulted in students getting used to using smartphones and playing games on them.

The advantage of implementing ICT-based learning media is that teachers can easily give students

assignments to first study the learning material that will be studied through the learning material link in the independent curriculum which is supported by technology because students are already proficient in operating smartphones. Meanwhile, the obstacle faced by teachers in implementing ICT-based learning media is that not all teachers are proficient in operating laptops/computers. There are still many teachers who cannot add animation to power points so that the power points displayed are still monotonous. Apart from that, teachers must direct students to use learning applications on laptops so that effective learning hours are reduced. Based on the opinion of (Fleischmann & Hutchison, 2012; Pulimood, Pearson, & Bates, 2016) good learning media will make students more interested in learning, can provide real learning experiences, and can help students learn at their own pace. In line with the times, especially in the era of industrial revolution 4.0, the application of ICT-based learning media is currently considered very relevant and effective for increasing students' cognitive knowledge. Research conducted by (Ktoridou, Doukanari, Whatley, & Nerantzi, 2016) shows that the application of ICT-based learning media in the form of the Quizizz application in lower grades is quite effective for students' cognitive development compared to using the Zoom Meeting application. Apart from that, using the Quizizz application can also encourage students to be more proactive in participating in learning and student learning outcomes can improve. Not only students but the quality of teachers also increases so that quality learning can be realized.

Challenges and Solutions in Information Technology Collaboration in Multidisciplinary Learning in Schools

Integrating technology into the educational curriculum, as implemented in elementary schools, comes with challenges. In this sub-discussion, we will explore the challenges faced in incorporating technology into learning and the solutions or strategies adopted to overcome these challenges (Damayanti, 2021). One of the main challenges in technology integration is the issue of infrastructure. Some schools may need more adequate access to hardware, stable internet connectivity, or other technological resources. This can be a severe barrier to adopting technology in learning. To address this issue, schools have invested in sophisticated technological infrastructure. Schools provide access to computer devices, fast internet connections, and the necessary educational software and applications. This investment is critical in ensuring all students have an equal opportunity to access technology-based learning. In addition to infrastructure issues, teacher training is also a significant challenge. Many teachers may not be familiar with technology or do not have sufficient skills to integrate it into their teaching. Schools take a proactive approach to address this issue. Schools provide regular technology training for teachers and ensure they are skilled in using digital tools and online learning platforms (Astini, 2020). This training helps teachers to feel comfortable and confident in adopting technology in the curriculum.

In addition to the training aspect, the access gap is also an issue. Not all students have personal devices or internet access at home, which can affect their ability to engage in technology-based learning outside of school. Schools have taken the initiative to provide technology access to all students, regardless of their economic background. Schools provide computers that can be borrowed by students who need them, and they also ensure that internet access is available at school or in the surrounding community. In this way, schools address the access gap and ensure that all students have access to technology-based learning. Furthermore, privacy and security issues are also essential concerns in the use of technology in education. With the large amount of student data generated through online learning, students' personal information must be protected strongly. Schools have taken stringent measures to protect student privacy. The school implements clear policies on using student data and ensures that all data is stored securely. This is an essential step in maintaining student and parent trust in the use of technology in education (Munohsamy, 2014). The best solution to these challenges is a holistic approach encompassing various aspects. Schools have shown that investment in infrastructure, teacher training, and student access are necessary to integrate technology into the curriculum successfully. In addition, there needs to be strong collaboration between schools, government, and other stakeholders to create a technology-enabled learning environment. With joint efforts, these

challenges can be overcome, and technology integration can successfully improve the quality of education.

4. CONCLUSION

This study highlights the significant potential of integrating information technology into multidisciplinary learning in elementary schools to enhance the quality of education in Indonesia. The findings emphasize that technology can enable more creative and effective learning strategies, fostering student engagement and skill development. However, successful implementation requires teachers to possess sufficient technological competencies, supported by ongoing curriculum evaluation and revision. Government initiatives, school supervisors, and professional teacher training are crucial to ensure smooth adoption and effective utilization of technology in education. Despite its promise, the research is limited in scope, focusing primarily on elementary education without exploring its broader applicability to other educational levels or specific regional challenges. Future research should investigate the long-term impacts of technology integration across diverse educational contexts, including rural and urban settings, and explore innovative teacher training models. Additionally, studies should examine the role of emerging technologies, such as AI and gamification, in enriching the learning experience and addressing existing disparities in educational access and quality.

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