Increase Creativity Learning and Pedagogical Skills of Teachers in Remote Schools based Hybrid Smart System (HSS) with K-Jalakar

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Abstract. This research aims to map the needed components to improve literacy activity and case solving skills by developing M-Module System Technology with 3D Makerless technology. The SAM development model fits the context of learning development to design modules with interactive and adaptive approaches. The Project Based Learn-ing model developed in 2022 and significantly combining teachers` soft skills with the characteristics of the Learning and Work Curriculum (K-Jalakar) and the Independent Curriculum needs to be introduced and disseminated to teachers in Indonesia. To support this goal, the presence of the Hybrid Smart System (HSS) is considered as a solution that supports the improvement of creative learning and pedagogical skills in teachers. This research will be carried out through the Research and Development method by focusing on HSS development which includes PBL with soft skills inspired by the K-Jalakar model. After the formation stage in the first year,this application will be tested through validation by experts and implementation in the field on a small scale. In the second year, HSS will be piloted on a wider scale and improved based on the results of the evaluation. It is hoped that application will be a solution to various problems faced by teachers in the implementation of their learning projects. This step is in line with the main objective of improving the quality of learning and implement-ing a more effective education process in Indonesia.

Keywords: *creativity learning, pedagogical skills, hybrid smart system, project-based learning*

1   Introduction

In the midst of an era that has been marked by very rapid technological advances, Indonesia implements the Merdeka Curriculum as an initiative in the field of education that aims to prepare students with a more contextual learning experience, through a Project Based Learning approach. Through this approach, the learning process is not only fixed on textbooks, but is closely related to the student's experience and the surrounding reality, including the rapid development of technology. However, keep in mind that not only students must master technology, but also teachers as facilitators in the learning process. Teachers who are proficient in the use of technology can create a more engaging learning experience for students[1].

The government through the Ministry of Education, Culture, Research, and Technology has basically provided several supports such as the Merdeka Mengajar Platform, Learning Community, Good Practice Sharing Resource Persons, and Webinar Series, to be a means for teachers to practice organizing a more interesting learning process through the use of technology. However, these supports still make teachers confused, especially on the features provided by the platform, so that teachers have not been able to creatively and freely create a modern learning process and in line with the learning model in the Merdeka Curriculum. As a result, the potential contained in each of the supports provided by the government has not been fully realized [2], [3].

As a solution to this problem, researchers have developed a Hybrid Smart System (HSS) as a tool for teachers in organizing a more modern and fun learning process by exploring features that are easier to access. HSS is designed to improve creativity learning and pedagogical skills in teachers, through integrated values from the Merdeka Curriculum which carries the concept of Project Based Learning (PBL) and K-Jalakar, which supports innovative learning processes. The optimal use of HSS is expected to create a more interesting and contextual learning ecosystem. In this article, we will discuss more about the concept, and the results of testing this application in the first year [4], [5].

2   The Concept of Merdeka Curriculum and K-Jalakar

2.1   The Concept of Merdeka Curriculum

The Merdeka Curriculum exists as a systemic effort in changing the paradigm of education. Since its inception, Curriculum Merdeka recognizes that education must be a vehicle that is more relevant and inclusive, and able to prepare students to face the demands of a dynamic era. This curriculum frees the learning process from traditional boundaries, so that each individual has the opportunity to grow and develop to his potential. The main concept of Curriculum Merdeka is "learning from, by, and for oneself" (self-initiated learning). This implies that education is not only centered on teachers as a source of knowledge, but also students' personal experiences, which are integrated with social experiences and technological developments. The Merdeka curriculum encourages more contextual learning, by linking the subject matter with students' daily realities [1], [6].

In addition, Curriculum Merdeka invites students to act as active learning agents, not just as recipients of information. This concept then becomes the basis for the implementation of PBL, independent research, and creative exploration, which indirectly encourages students to develop relevant skills and critical thinking abilities. The Merdeka curriculum also emphasizes moral values, character, and leadership. Overall, the Merdeka Curriculum does not change the structure in the learning process, but also the paradigm in education. Validation given to each student's uniqueness, along with autonomy in the learning process, the Merdeka Curriculum aims to create a generation that is better prepared to face future challenges and able to contribute to the progress of the nation[7], [8].

2.2   The Concept of K-Jalakar

K-Jalakar is a curriculum concept that combines the situation and potential of people in a region with contemporary innovations, so as to create a unique and relevant framework for understanding and developing art and culture. As a curriculum, K-Jalakar serves as a bridge between the past and the present. It is not only about maintaining and celebrating traditional cultural roots, but also about bringing the spirit of innovation to the development of art and culture. K-Jalakar teaches students to appreciate and perceive the wisdom embodied in the local culture. Within K-Jalakar, there is a deep understanding of how art and culture can be a means to promote tolerance, diversity, and creative growth. K-Jalakar has made valuable contributions to teacher and student understanding of the importance of nurturing cultural roots, while moving forward to a brighter future in the world of arts and culture [2].

In the Guidelines for the development of operational curriculum in education units, it is stated that the organization of learning to achieve Learning Outcomes (CP) and the Pancasila Learner Profile is carried out in three groups of learning activities, namely intracurricular, projects to strengthen the Pancasila learner profile, field work practice (PKL), and extra-curricular [9], all of which can be integrated (integrated learning). Conceptually, integrated learning is a development practice from correlated to integrated that unites (mixes) several subjects and or activities into a series of learning experiences. Many ways and models of implementing integrated curriculum/learning can be chosen and adapted by practitioners and developers [10], [11], [12], [13]. Researchers have experienced integrating curriculum by developing it based on life work in rural areas and producing a curriculum (K-Jalakar) complete with a structure model, content and learning model [14]. Many research results show the advantages of integrated curriculum and learning, especially to improve reading skills [15], [16], more cohesive to hone talents [17], train employability [18], and provide a comprehensive experience [19], and can even be integrated with learning through online systems [20]

3   Creativity Learning and Pedagogical Skills of Teachers

Every teacher basically needs to innovate in learning approaches to encourage the implementation of creative learning processes. This approach focuses on providing learning tools that support the development of student creativity, in order to enable each student to develop his or her creative potential. Creativity learning means that all students are given the opportunity to explore and realize their creative ideas, while the teacher acts as a facilitator who helps students overcome learning barriers. The concept of creativity learning emphasizes innovation that comes from students, where students are encouraged to have an open mind, dare to express, and try new things. Pedagogically, teachers need to create inclusive and flexible learning environments [21], [22].

Flexibility is key to supporting students in expressing imagination through the completion of project assignments. Thus, reflecting student innovation in the learning process and the role of the teacher here is to support students in developing it. The creativity learning approach also encourages teachers to develop pedagogical skills, which in fact are closely related to the teacher's ability to manage learning effectively in the classroom. Teachers need to understand students as learning subjects to avoid delivering monotonous material and making students feel bored. In addition, teachers must also be able to manage learning time well according to the diverse learning needs of students. This understanding will affect the teacher's ability to design learning scenarios and convey them effectively to students. Even in today's digital era, teachers must have the ability to use technology to achieve learning effectiveness. Therefore, continuous improvement in pedagogical skills becomes an important strategic step for teachers as educational professionals [23], [24].

The following is the interface of the Hybrid Smart System that researchers are developing.
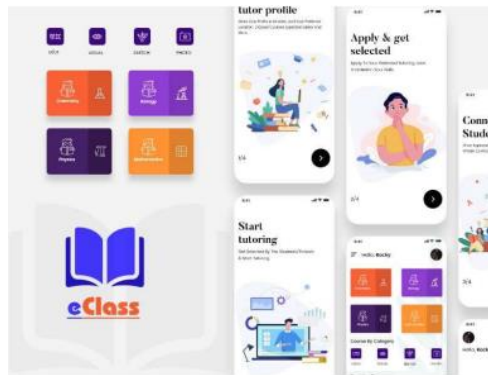

Fig 1. Hybrid Smart System Design modeled by K-Jalakar

4   Utilization of Hybrid Smart System (HSS) with K-Jalakar Model through Project Learning Integration

4.1   The Use of Smart Systems in Education

The existence of smart systems in the midst of the digital learning era is now gaining popularity, while offering a number of benefits and conveniences that are quite diverse. The technology system plays an important role in supporting the development of learning by integrating Artificial Intelligence. In the learning process, technology integration includes tools that automatically assist teachers in various tasks, so that teachers can more easily recognize the dynamics of the learning environment in schools and improve abilities significantly [5], [25], [26].

The main advantage of smart systems is increased efficiency and effectiveness of learning. Efficiently, this technology is able to replace the role of an education expert in analyzing student learning problems, so that teachers can be more objective

and precise in improving the quality of learning. Smart system technology is also able to support curriculum development flexibly based on needs. This flexibility can be seen from the capacity of smart system technology to assess the material and methods that best suit the characteristics of students. Therefore, cooperation between teachers and students in achieving learning objectives can be realized more effectively and efficiently. The use of smart system technology is generally based on the analysis of various factors that affect the learning process in dynamic learning activities, both internally and externally. The factors identified are factors that play a role in increasing student learning success. Smart system technology is able to analyze these factors quickly and accurately based on available data[27], [28].

M-Module system with 3D markerless technology in the form of a digital module innovation that developed by utilizing 3D technology and without using 3D modeling tools or 3D printers (markerless) [29], [30]. This innovation aims to improve students' skills in understanding abstract concepts through three-dimensional visualization. The visualization increases student interaction with the learning module in an interesting way. The innovation of M-Module system with 3D markerless technology contains various excellent features to improve literacy activity and case solving skills. The increase in literacy activity and case solving skills is due to the technology developed that allows students to understand concepts in three-dimensional form. This makes it easier for them to understand complex concepts. As a result, students' enthusiasm in accessing digital modules will be encouraged and challenged. In addition, the M-Modul system technology allows students to change their learning perspective in real-time and interactively. They can understand concepts from various other perspectives, so that students' understanding is more comprehensive. The M-Module system's 3D Markerless technology is designed to make it easy for students with an intuitive interface. It also comes with easy-to-understand guides. This is in line with the display in digital format that allows students to access easily. The 3D markerless technology M-Module system can help teachers teach abstract concepts in a more interesting and effective way. In addition, this innovation can also accelerate the achievement of learning objectives by helping students prepare for the digital world.

4.2   Hybrid Smart System Innovation with K-Jalakar Model through Project Learning Integration

The K-Jalakar model of Hybrid Smart System innovation is a learning approach that combines digital technology with the structure of the learning and work curriculum, with the aim of stimulating student creativity through strengthening teachers' digital skills. The main focus of K-Jalakar is the development of teachers' ability to design projects that are interesting and beneficial to students. This design process covers all aspects, from concepts to presentations, carried out by students with the guidance of teachers as facilitators. This curriculum combines innovative learning methods with digital technology based on smart systems. The features in this application are intended to increase teacher creativity learning and pedagogical skills in developing interactive learning, so that the learning process becomes more adaptive

and provides space for teachers to explore student potential more deeply. The K-Jalakar Hybrid Smart System innovation creates a learning ecosystem that combines innovative approaches with digital technology to improve student creativity and teacher learning quality [2], [4], [31].

The design includes the concept, design, development and presentation of the project by the students with the facilitator of the teacher. The curriculum combines innovative learning methods with smart system-based digital technology to enhance teachers' creativity and pedagogical skills in designing interactive learning. The integration of project learning in the K- Jalakar curriculum allows teachers to develop practical and creative skills in a real context. Teachers will have a holistic experience in planning and implementing learning in the classroom. The advantages of the K-Jalakar curriculum for the development of teacher creativity and pedagogical skills can be done by choosing the right technology. The utilization of smart system technology in learning is an innovative learning approach that is relevant today. In the context of education that is increasingly integrated with digital technology, K-Jalakar is one of the solution curriculums to improve the quality of learning by developing teachers' digital skills. K-Jalakar focuses on creating strategic projects according to the development of learning needs. Hybrid smart system innovation is an intelligent system by combining the latest learning approaches with the use of digi-tal technology based on expert systems. The technology is designed to facilitate teachers in developing projects with the involvement of technology. Thus, the solution can overcome various problems that occur during project work to achieve project goals effectively and efficiently. The Hy-brid Smart System that will be produced as an output in 2023 is an innovative digital application product to implement the curriculum developed through a series of long roadmaps.

The development of this Hybrid Smart System is carried out for two years (2023 and 2024) using the Research and Development (R&D) method, with a development model adapted from the Successive Approximation Model (SAM) model. SAM development consists of 3 main stages, namely preparation, iterative design, and iterative development. In the preparation stage, researchers analyze teacher needs, learning objectives in each subject, and material content. Furthermore, at the iterative design stage, researchers design storyboards and storytelling that discuss a series of steps for developing digital modules. After the storyboard is successfully compiled, a review will be carried out with the development team, learning experts, and students as users. Finally, at the iterative development stage, researchers developed a digital module with 3D Marketless technology. This stage is carried out after the storyboard is approved. Researchers always test the use of digital modules, until later no errors are found and maximally able to meet quality standards and student needs.

The following is the flow of the smart system research and development process.
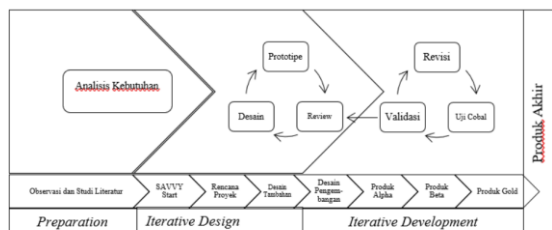
Fig 2. *Smart System Research and Development Flow*

The Hybrid Smart System has so far succeeded in helping teachers who have not fully utilized technology in learning, so they no longer find it difficult to operate the templates and features provided by the Hybrid Smart System. As a result, students become more enthusiastic in following a more interesting and dynamic learning process thanks to the help of technology. Through the Hybrid Smart System, teachers in remote schools are able to improve creativity learning and pedagogical skills effectively and efficiently, without having to worry about network problems and school facilities. This is because the Hybrid Smart System has an interface that is easy for students to understand. Having proven effective in helping teachers overcome the challenges faced in the era of digitalization, this application will continue to be updated according to the demands and needs of education in modern times. The use of Hybrid Smart System in remote schools involves the integration of Indonesian, Natural Sciences, and Social Sciences subjects from K-Jalakar with Information and Communication Technology subjects. In this system, teachers are given various features to plan and implement the Learning Objective Flow (ATP). Through these attractive and easy-to-use features, teachers have great flexibility in presenting learning with more attractive models and displays, as well as improving the quality of learning in the era of digitalization.

5 Conclusion

The Merdeka Curriculum, which is a new curriculum in Indonesia, basically has three main characteristics, namely an emphasis on developing soft skills and character, focusing on essential materials, and using a more flexible learning process. Therefore, it is expected that teachers in Indonesia will be able to adopt a more innovative approach in organizing learning in accordance with the needs of the digitalization era. Although the government has provided several online platforms as a solutive effort, the solution has not been fully effective in helping teachers in remote areas. This research aims to create a Hybrid Smart System (HSS) as an alternative solution, with the hope of helping teachers operating in remote schools to become more innovative in their learning approach. The Hybrid Smart System combines the project-based learning model introduced by K-Jelakar with the values contained in the Merdeka Curriculum.

References

[1]   L. Bertel, I. Askehave, H. Brohus, O. Geil, A. Kolmos, and N. Ovesen, "Advances in Engineering Education Digital Transformation at Aalborg University : in a Post Digital Age," pp. 1–13, 2021.

[2]   W. N. Hidayat, N. Ulfatin, A. Mukhadis, and R. Wakhidah, "Development of Virtual Learning Community through My Buddy School System," in *IOP Conference Series: Materials Science and Engineering*, 2020, doi: https://doi.org/https://doi.org/10.1088/1757-899X/732/1/012112.

[3]   Kemendikbudristek, *Keputusan Mendikbudristek Nomor 56/M/2022 tentang Pedoman Penerapan Kurikulum dalam rangka Pemulihan Pembelajaran*. 2022.

[4]   Y. Gambo and M. Z. Shakir, "Students' Readiness for Self-Regulated Smart Learning Environment," *Int. J. Technol. Educ. Sci.*, vol. 6, no. 2, pp. 306–322, 2022, doi: https://doi.org/https://doi.org/10.46328/ijtes.341.

[5]   R. M. Tawafak, G. Alfarsi, and J. Jabbar, "Innovative Smart Phone Learning System for Graphical Systems within Covid-19 Pandemic," *Contemp. Educ. Technol.*, vol. 13, no. 3, 2021, doi: https://doi.org/https://doi.org/10.30935/cedtech/10879.

[6]   W. H. Prasetiyo, B. Sumardjoko, A. Muhibbin, N. B. M. Naidu, and A. Muthali'in, "Promoting Digital Citizenship among Student-Teachers: The Role of Project-Based Learning in Improving Appropriate Online Behaviors," *Particip. Educ. Res.*, vol. 10, no. 1, pp. 389–407, 2023, doi: https://doi.org/https://doi.org/10.17275/per.23.21.10.1.

[7]   S. Asquith and E. Frazier, "Using Augmented Reality for Collaborative Multimodal Storytelling. Intelligent CALL," in *Granular Systems and Learner Data: Short Papers from EUROCALL 2022*, 2022, pp. 7–11, doi: https://doi.org/https://doi.org/10.14705/rpnet.2022.61.1426.

[8]   T. T. Kiong, N. S. M. Rusly, R. I. A. Hamid, C. K. S. Singh, and Z. Hanapi, "Inventive Problem-Solving in Project-Based Learning on Design and Technology: A Needs Analysis for Module Development," *Asian J. Univ. Educ.*, vol. 18, no. 1, pp. 271–278, 2022, doi: https://doi.org/https://doi.org/10.24191/ajue.v18i1.17196.

[9]   Kemendikbudristek, *pengembangan kurikulum operasional di satuan pendidikan*. 2022.

[10]   R. Fogarty, "Ten ways to integrate curriculum," *Educ. Leadersh.*, vol. 49, no. 2, pp. 61–65, 1991.

[11]   F. L. Loepp, "Models of curriculum integration," *J. Technol. Stud.*, vol. 25, no. 2, pp. 21–25, 1999.

[12]   M. L. Kysilka, "Understanding integrated curriculum," *Curric. J.*, vol. 9, no. 2, pp. 197–209, 1998.

[13]   N. Ulfatin and A. Mukhadis, "Learning Model (IS Based GP) in the Developing of the Empirically Testing in the Research Field of Teachers Student," in *International Conference on Education and Technology (ICET 2018)*, 2018, pp. 135–138.

[14]   U. Ulfatin and A. Mukhadis, "Matching Curriculum for Junior High School Students in Rural and Remote Areas in Indonesia: Towards The Needs of Learning and Working," *J. Basic Appl. Sci. Res.*, vol. 5, no. 12, pp. 71–79, 2015.

[15]   R. C. Morris, "A guide to curricular integration," *Kappa Delta Pi Rec.*, vol. 39, no. 4, pp. 164–167, 2003.

[16]   E. F. Crawley *et al.*, "Integrated curriculum design," *Rethink. Eng. Educ. CDIO Approach*, pp. 77–101, 2007.

[17]   C. B. Decorse, "Teachers and the integrated curriculum: An intergenerational view," *Action Teach. Educ.*, vol. 18, no. 1, pp. 85–92, 1996.

[18]   A. D. Rowe and K. E. Zegwaard, "Developing graduate employability skills and attributes: Curriculum enhancement through work-integrated learning," 2017.

[19]   G. Malnarich, E. D. Lardner, and W. C. Co-Directors, "Designing integrated learning for students: A heuristic for teaching, assessment and curriculum design," *Washingt. Cent. Occas. Pap.*, vol. 1, pp. 1–8, 2003.

[20]   J. S. Nevid, *Psikologi: Konsepsi dan aplikasi*. Nusamedia, 2018.

[21]   O. A. Desmet and A. M. Roberts, "Teaching for Positive and Transformational Creativity through Service Learning," *Educ. Sci.*, vol. 12, no. 4, 2022, doi: https://doi.org/10.3390/educsci12040234.

[22]   M. E. Caingcoy, "Journal of World Englishes and Educational Practices (JWEEP) Research Capability of Teachers: Its Correlates, Determinants and Implications for Continuing Professional Development," 2022, doi: https://doi.org/10.32996/jweep.

[23]   S. Atthachakara, "Developing Practical Skills Through Blended Learning Model Using Creativity-Based Learning Activites that Enhances Creative Thinking for Education Students Majoring in Social Studies at Mahasarakham University," *J. Educ. Learn.*, vol. 10, no. 6, p. 126, 2021, doi: https://doi.org/10.5539/jel.v10n6p126.

[24]   C. Ricardo-Barreto *et al.*, "Teachers' Perceptions of Culturally Appropriate Pedagogical Strategies in Virtual Learning Environments: A Study in Colombia," *Turkish Online J. Distance Educ.*, vol. 23, no. 1, pp. 113–130, 2022, doi: https://doi.org/10.17718/tojde.1050372.

[25]   S. R. Raharjo, P. W. Handayani, and P. O. H. Putra, "Active Student Learning through Gamification in a Learning Management System," *Electron. J. E-Learning*, vol. 19, no. 6, pp. 601–613, 2021, doi: https://doi.org/https://doi.org/10.34190/EJEL.19.6.2089.

[26]   A. Qurtubi, "Digital-Based Smart Campus at Telkom University, Indonesia," *Educ. Q. Rev.*, vol. 5, no. 3, pp. 259–269, 2022, doi: https://doi.org/https://doi.org/10.31014/aior.1993.05.03.543.

[27]   I. Omirzak, A. Alzhanov, Kartashova, and V. O. Ananishnev, "Integrating Mobile Technologies in a Smart Classroom to Improve the Quality of the Educational Process: 18 Synergy of Technological and Pedagogical Tools," *World J. Educ. Technol. Curr. Issues*, vol. 14, no. 3, pp. 560–578, 2022, doi: https://doi.org/https://doi.org/10.18844/wjet.v14i3.7194.

[28]   I. Maslo, "A Smart-Merging Facilitation Model (SMFM) of Meaningful Learning for Life and work in the Digital Era," *J. Educ. Sci.*, vol. 44, no. 2, pp. 3–18, 2021, doi: https://doi.org/https://doi.org/10.35923/jes.2021.2.01.

[29]   R. Gudlavalleti, A. Pandey, M. Malviya, S. Gandhi, and M. Kasar, "A Comparative Study of Interior Designing Using Markerless Augmented Reality," 2022.

[30]   O. Rosfiani, M. C. M. Hermawan, F. Rizqiya, and D. A. Sidqi, "Bimbingan Teknis Perancangan Modul Ajar Berbasis Merdeka Belajar dan Terpusat pada Murid," *Kawanad J. Pengabdi. Kpd. Masy.*, vol. 1, no. 2, pp. 162–169, 2022.

[31]   Kemendikbudristek, *Panduan Pengembangan Kurikulum Operasional di Satuan Pendidikan*. Jakarta: Balitbangbuk, Kemendikbudristek, 2022.