

Transformation of High School or Vocational School Teacher Competencies in the Era of Society 5.0

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Abstract

The era of Society 5.0 requires education systems to integrate digital technology and artificial intelligence (AI), positioning teachers as key actors in adaptive and innovative learning. This study aims to describe the performance and competencies of senior high school and vocational school teachers in South Kalimantan Province. A descriptive quantitative design was employed involving 279 teachers and 2,280 students from 30 purposively selected schools representing diverse geographical areas. The main variables measured include teachers' competence in (1) planning learning (formulating objectives, developing teaching materials, selecting methods and media), (2) implementing learning, (3) evaluating learning outcomes, and (4) utilizing ICT-based learning media. Data were collected using structured questionnaires, observations, and documentation, and analyzed through descriptive statistics (percentage, frequency distribution, mean, median, and mode). The findings show that teacher competence is generally in the "adequate" category. Specifically, 39.4% of teachers are categorized as adequate in formulating learning objectives, 38.4% in selecting learning methods and strategies, and 41.2% in aligning methods with students' cognitive, affective, and psychomotor development. These results indicate that although teachers have met basic competency standards, their ability to integrate digital technology into pedagogy remains suboptimal. Therefore, systematic and continuous efforts such as applied ICT-based training, mentoring, and strategic collaboration with universities and industry are essential to strengthen teachers' pedagogical and technological competencies in supporting sustainable educational transformation.

Keywords:

Descriptive Quantitative Research; Transformation; Teacher Competency Society 5.0 in Education;

(*) Corresponding Author: syahlan@gmail.com

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INTRODUCTION

Learning tools in the world of education today are developing rapidly. This is supported by the massive application of information and digital technology in various fields of life, including education (Dunbar & Cooper, 2020). Teachers and school communities today are required to be able to take advantage of the positive impact of the technology industry, which has entered the era of society 5.0 (Rasulov et al., 2023).

The 5.0 society era itself is a momentum in which today's society coexists with artificial intelligence (AI) (Hermawan et al., 2020). According to research by Litbang Kompas (12/10/2021), the era of society 5.0 is a continuation of the development of the fourth generation or era 4.0, where there is still a gap between virtual and physical activities (Umro, 2020). In society 5.0, artificial intelligence and big data are intertwined in everyday human behavior. The focus of Industry 4.0 is on renewing global industrialization. Meanwhile, the era of society 5.0 is an era in which society can utilize the technology available in industry 4.0 with the aim of improving the welfare of the global community (Carayannis et al., 2021).



In general, the era of Society 5.0 can be an arena where every element of society, both individuals and communities, can strive to utilize technology to improve their quality of life and solve various existing problems (Carayannis & Morawska-Jancelewicz, 2022). Through the use of technology in the field of education, for example, it is hoped that learning patterns can be improved with sophisticated technology and digitalization as an effort to increase innovation, productivity, efficiency, and sustainable quality of life in the future (Enyanto et al., 2024; Surahman, 2024).

The phase of information technology integration in education involves utilizing the Internet of Things, which includes big data analysis, cloud computing, cyber-physical systems, digital manufacturing, cyber security, and the use of artificial intelligence (AI), which has been popular lately (Carayannis, Dezi, et al., 2022). The use of information and digital technology in schools, for example, can indirectly have a significant impact on the education system, in terms of curriculum, learning processes, and the preparation of ready-to-use human resources (Carayannis, Christodoulou, et al., 2022).

The downstreaming program currently being promoted by the Government of the Republic of Indonesia has become a kind of core value in improving skilled and ready-to-use human resources. The concept of downstreaming in the field of education is intended as a strategic effort between the worlds of education, research, and industry to increase real contributions in breaking the chain of inequality in society.

Through downstreaming in the field of education, teachers and educators in schools can utilize information and digital technology through various instruments, such as implementing Internet of Things-based learning in line with the curriculum and digital platforms that have been provided (Purnama & Dwikurnaningsih, 2021). With digital transformation, teachers can not only develop teaching content, but also improve their competence as educators and dynamic, innovative, and transformative learners.

The big question is, to what extent can teachers, as the main bridge of learning in the classroom, take advantage of these opportunities? Even though we are now part of a global community (global village), there are still educational disparities and unequal access to digital technology in some areas. Not to mention the increasingly complex workload of educators. Improving the quality of learning and the competence of teachers as the frontline in educational transformation is one of the efforts to address the various challenges that have emerged. Educational challenges in the era of industry 5.0 involve a series of significant changes in learning paradigms, skill requirements, and work environments (Faya., et al., 2025).

Despite the extensive discourse on Society 5.0, digital transformation, and the integration of artificial intelligence and Internet of Things (IoT) in education, existing studies tend to emphasize conceptual frameworks and policy directions rather than providing empirical evidence on how these transformations are manifested in teachers' actual classroom practices. In particular, there is still limited quantitative descriptive research that systematically maps teachers' competencies across key pedagogical dimensions, such as planning, implementation, evaluation, and the integration of ICT-based learning media within diverse regional contexts. Furthermore, previous studies often generalize teacher readiness without clearly identifying specific competency gaps that hinder the effective alignment between pedagogical practices and digital technology utilization.

In the context of South Kalimantan, although several reports indicate variations in teacher readiness and the availability of educational infrastructure, these findings have not been sufficiently analyzed to explain the relationship between teachers' competencies and the demands of digital transformation in learning. The absence of a clear analytical linkage between macro-level educational transformation and micro-level classroom practices creates a gap in understanding how teachers operationalize technology-integrated

pedagogy. Therefore, this study seeks to address this gap by providing a data-driven, descriptive analysis of teacher competencies based on measurable indicators, while also incorporating students' perspectives to offer a more comprehensive picture of instructional quality in the era of Society 5.0.

Improving teacher competency in the era of information and digital technology is an inevitable effort (Masitoh & Cahyani, 2020; Akbar, 2021; Sulistyarini & Fatonah, 2022; Rambe, N. A., Saragi, D., & Rajagukguk, W., 2025). As is the case in South Kalimantan, only around 30 to 33% of high school teachers implement transformative learning in accordance with the new national standards, and only around 71 to 77% of school facilities meet the national standards. This is where a comprehensive analysis is needed on how the performance and competency stages of teachers, especially high school teachers, can overcome the gaps and challenges of the increasingly rapid industrial revolution in line with the established indicators.

METHODS

This study uses quantitative methods with descriptive analysis. The purpose of the study is to describe the actual performance of high school teachers in Kalimantan Province, starting from planning lessons, implementing lessons, and evaluating learning outcomes. Data were collected through surveys, documentation, and field observations, then processed using descriptive statistics to display the mean, percentage, frequency distribution, median, and mode.

The population of this study consisted of teachers and students from public and private senior high schools/vocational schools in South Kalimantan. A purposive sampling technique was used to select 30 schools representing urban, coastal, and mountainous areas to ensure contextual variation. The total sample included 279 teachers and 2,280 students. Teachers served as the primary respondents for competency measurement, while students' responses were used to validate instructional practices from the learner perspective.

The main variables measured in this study included: (1) learning planning competence (formulating learning objectives, developing teaching materials, selecting methods and strategies, and determining ICT-based learning media), (2) learning implementation competence (clarity of material delivery, use of methods and media, and classroom interaction), (3) evaluation competence (designing and applying assessment instruments), and (4) ICT integration competence in learning. Each variable was operationalized into measurable indicators derived from national teacher competency standards and relevant pedagogical frameworks.

Data were collected using structured questionnaires with a Likert scale ranging from 1 (very poor) to 5 (very good), supported by observation sheets and documentation studies. The questionnaire instruments were distributed to teachers, students, and school principals to obtain multi-source data. To ensure instrument validity, the items were developed based on theoretical constructs and reviewed by experts in educational technology and pedagogy, while reliability was assessed using internal consistency measures.

Data analysis was conducted using descriptive statistical techniques, including mean, percentage, frequency distribution, median, and mode, to provide a comprehensive profile of teacher competencies. The results were then categorized into qualitative levels (very poor, poor, adequate, good, and very good) based on predetermined score intervals. In addition, comparative interpretation was carried out between teacher self-assessment and students' perceptions to identify consistency and gaps in instructional practices. This approach allows for a more precise and data-driven understanding of teacher performance in responding to the demands of digital transformation in education.

RESULTS & DISCUSSION

RESULTS

In South Kalimantan, administratively, high school teachers have carried out their roles and duties in accordance with their assigned workload. However, with the advancement of technology, several obstacles are still encountered in the field, ranging from the availability of tools to the uneven competence of teachers. Not only that, the quality and relevance of learning tools remain a challenge. This is why strategic and comprehensive measures are needed so that teachers' capacity and competence are not limited to merely developing learning tools that are adequate.

Based on statistical data released by BPS Kalsel 2024, there are 10,980 teachers in South Kalimantan. Of these, 9,527 have a bachelor's degree and 975 have a master's degree, with the rest having other levels of education. This can be seen in Diagram 1. The following image shows that the educational level of most teachers meets the requirements to be a teacher, namely a bachelor's degree.

In fact, there are already many teachers with master's degrees and possibly some with doctorates, but the data has not yet been recorded. Educational qualifications can certainly be directly proportional to the quality of their work. In fact, performance levels are also supported by the teachers' professional certificates. According to the available data, the number of teachers who are certified educators exceeds 50% of all teachers. According to data from the South Kalimantan Provincial BPPS for 2024, the number of teachers who are certified educators is 5,642, while 5,338 are not yet certified.

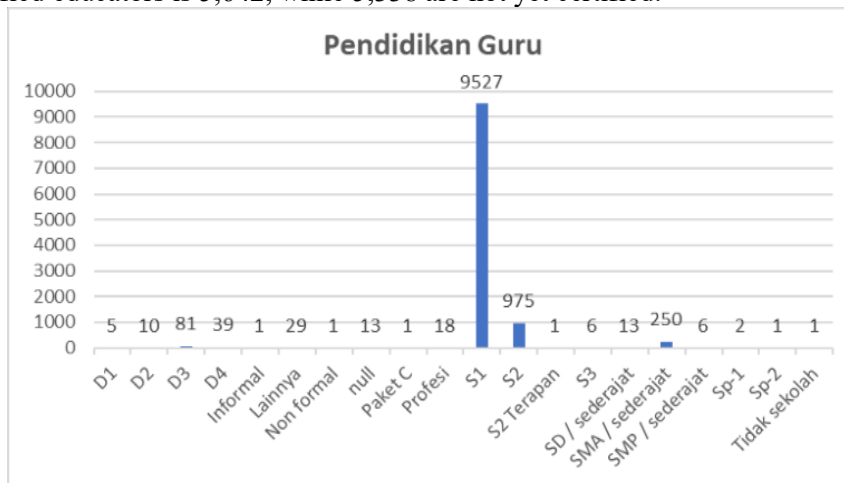


Figure 1. Teachers' Education Levels in South Kalimantan (Source: South Kalimantan Statistics Agency, 2024)

From the data presented above, it appears that there is strength in terms of teacher quality in South Kalimantan. This strength is a potential that will influence the program and implementation of teacher improvement in senior high schools/vocational schools in South Kalimantan.

In addition to teachers' educational qualifications, infrastructure support for senior high schools and vocational schools in South Kalimantan is relatively adequate. Based on data from the Central Bureau of Statistics (BPS) of South Kalimantan in 2024, there are thousands of secondary education units distributed across the province, covering both general and vocational schools. This distribution indicates that access to secondary education is generally available across different regions. However, rather than focusing solely on the total number of schools, the more critical issue lies in the equitable distribution and the extent to which existing facilities support the integration of digital technology in

learning. Therefore, infrastructure availability can be considered a supporting factor for human resource development, although its effectiveness depends on how well it is aligned with the needs of technology-based learning in the era of Society 5.0.

The complexity and challenges that arise encourage teachers to strategically optimize their role as innovative learning facilitators. The availability of teachers with bachelor's degrees and the use of digital products are like two sides of the same coin. Curriculum interventions originating from the central government cannot only be used as the main tool in developing learning tools. They need to be enriched and adapted to the current context so that learning objectives can be achieved optimally, especially in improving their competence in the learning process.

In general, teacher competence in the learning process can be observed from at least three main aspects, namely competence in developing learning tools (planning), competence in implementing learning, and competence in evaluating learning outcomes. Competence in developing learning tools includes, among other things, formulating learning objectives, developing teaching materials, selecting learning methods, and determining ICT-based learning resources and media, as well as competence in developing evaluation tools. Meanwhile, in the aspect of implementing learning, the competencies include competence in delivering material in a language that is easy for students to understand, the extent to which learning methods, strategies, and media are used, and how to assess student learning outcomes in the classroom.

From these various aspects, it can be seen in the research that has been conducted that the competence of high school teachers in South Kalimantan is generally still in the adequate category. This data was obtained from the perspective of teachers as research subjects. For example, competence in formulating learning objectives. The competence of high school teachers in South Kalimantan is generally still in the adequate category with a percentage of 39.4%. This can be seen in the following diagram:

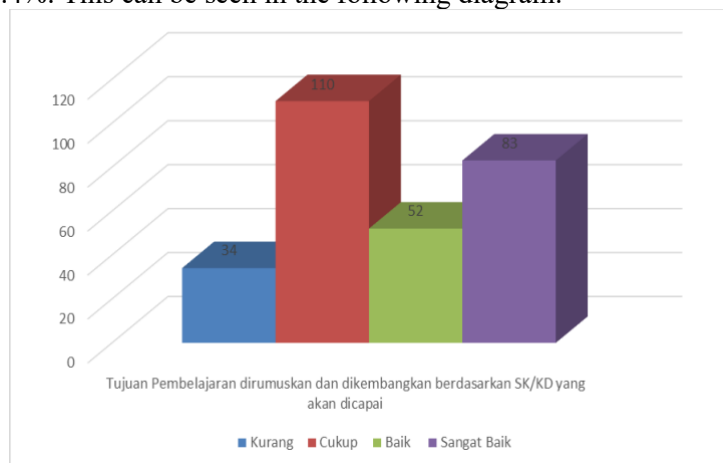


Figure 2. Teacher Competency in Formulating and Developing Learning Objectives Based on Indicators to be Achieved.

This also applies to the competency of choosing learning methods. Whether we admit it or not, learning scenarios also greatly determine whether the learning objectives designed by teachers will be achieved. There are several sub-competencies related to this competency. This aspect emphasizes the extent to which the chosen learning approaches, methods, and strategies are relevant to the learning objectives. The results of the field study are illustrated in the following diagram:

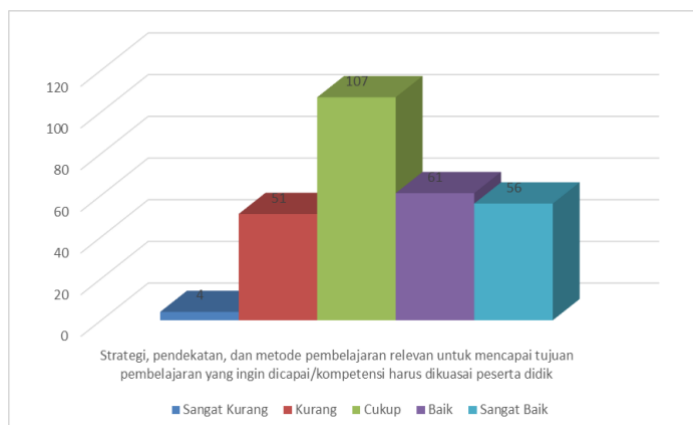


Figure 3. Teacher Competence in Selecting Learning Approaches, Methods, and Strategies Tailored to the Competencies that Students Must Achieve

The table indicates that most teachers are still in the adequate category. There are 107 (38.4%) adequate lesson plans/modules, 61 (21.9%) good ones, 56 (20.1%) very good ones, and 56 (20.1%) excellent ones, with the rest being very poor. Although there are quite a lot of teachers who are classified as good and very good, there are still many who are in the adequate category. This means that teachers' competence in this aspect still needs to be improved.

Still related to the selection of learning approaches, methods, and strategies, there is another competency that teachers must master, namely whether the selection of learning methods is based on the ease of student understanding. The results of the field study related to this aspect can be illustrated in the following diagram:

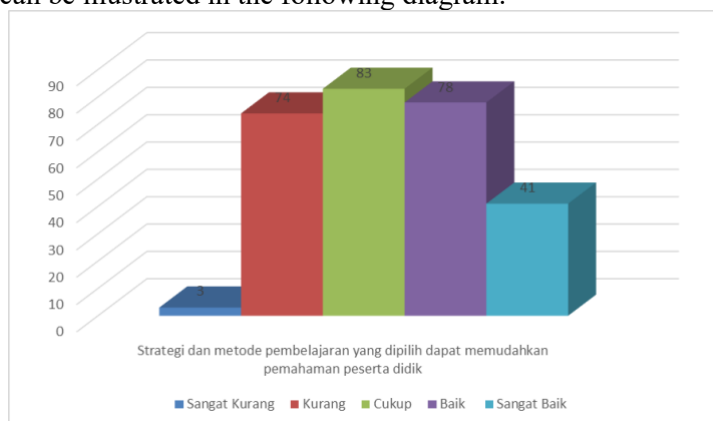


Figure 4. Teacher Competence in Selecting Learning Approaches, Methods, and Strategies to Facilitate Student Understanding

The diagram above shows that the majority of teachers' lesson plans are rated as poor, adequate, and good. There are 74 (26.5%) lesson plans/modules that are rated as poor, 83 (29.7%) that are rated as adequate, and 78 (28.0%) that are rated as good, while the rest are rated as very good and very poor. In conclusion, for this aspect, the teachers' formulations are relatively adequate, but they still need to be improved so that more teachers have formulations that are categorized as good and very good.

The selection of learning methods also needs to be adjusted to the cognitive, affective, and psychomotor development of children. This is important so that the selected methods can help and motivate children to learn. The results of the field study related to this can be seen in the following.

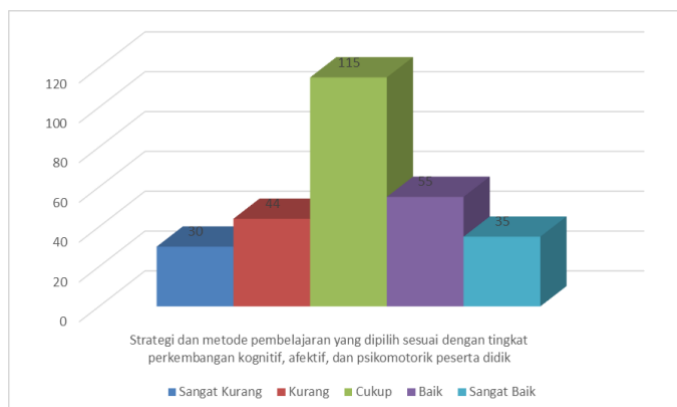


Figure 5. Teacher Competence in Selecting Learning Approaches, Methods, and Strategies in Accordance with Students' Cognitive, Affective, and Psychomotor Development

The diagram shows that 115 (41.2%) of the teachers' lesson plans/modules were categorized as adequate in terms of selecting teaching methods that were aligned with the cognitive, affective, and psychomotor development of students. The number of teachers whose lesson plans were categorized as inadequate or very inadequate was relatively high. Therefore, competence in this aspect still needs to be improved. In the learning process, the allocation of time for each stage of the selected method needs to be linked to the complexity of the material. The aim is for teachers and students to be able to learn in a balanced manner at each stage of learning and not waste time.

The selection of media also needs to be aligned with the material, method, and level of cognitive, affective, and psychomotor development of students. The level of cognitive development correlates with the stages of student thinking. Students possess concrete thinking stages before reaching the abstract level. Therefore, the selection of methods, strategies, teaching materials, and learning media needs to be aligned.

The assessment of teacher competence as described above focuses on the understanding of teachers as research subjects. Meanwhile, from the students' perspective when participating in learning, it was found that the competence of high school teachers in South Kalimantan was relatively good. This was assessed from a number of aspects that were the main indicators, including the delivery of material in easy-to-understand language and the use of appropriate learning media. This can be seen in the following diagram:

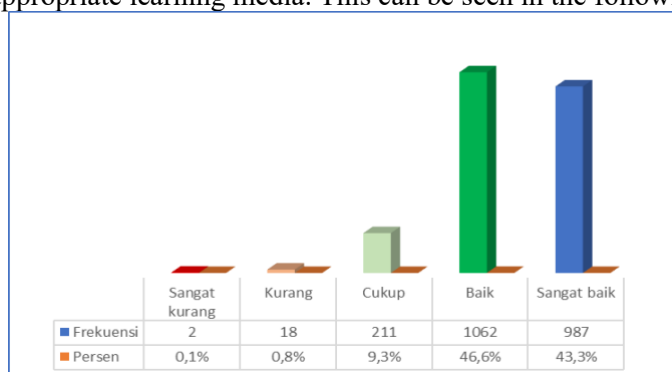


Figure 6. Delivery of Material that is Easy for Students to Understand

The diagram shows that 1,062 or 46% of students consider that teachers have delivered the material in a language that is easy to understand. In fact, 987 or 43% consider it to be very good, with only a few saying it is not good.

Meanwhile, in the context of the use of technology and information, students believe that high school teachers in South Kalimantan have used technology and information quite well in the learning process in the school environment. This can be seen in the following diagram:

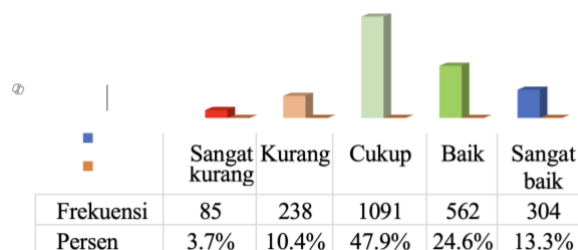


Figure 7. Use of Information and Communication Technology

The diagram above shows students' perceptions of the use of learning media in the learning process. There are 1,091 (47%) students who consider the use of learning media by teachers to be sufficient, 562 (24.6%) students consider it good, and 304 (13.3%) consider it very good. However, there are still 238 (10.4%) who consider it poor, and 85 (3.7%) students consider it very poor. This data shows that the use of media is quite good, but there are still teachers who do not use learning media well. This means that the use of media also needs to be improved so that the percentage of good and very good can increase.

Based on the overall data, the competence of teachers in South Kalimantan is not yet optimal. In formulating learning objectives, only 55.2% of teachers are competent in formulating learning objectives that reflect the processes and outcomes that can be achieved by students. In developing teaching materials, only 44.4% of teachers are competent in designing the breadth and depth of the teaching materials and paying attention to the competencies of students. In developing learning scenarios, 57% of teachers are quite capable of developing learning scenarios in accordance with the selected *SINTAKS* learning model and providing sufficient allocation in accordance with the stages of learning; in terms of competence in developing learning resources and learning media, 41% of teachers are quite capable of determining learning resources and learning media; and in terms of competence in developing evaluation tools, 53% of teachers are quite capable of developing evaluation instruments.

Discussion

Entering the era of the Industrial Revolution 5.0 requires everyone to have the opportunity to take advantage of technological advances (Naila et al., 2021; Listiaji & Subhan, 2021). Likewise, in the world of education, educators in schools must develop their capacities in line with the increasingly rapid development of digital technology (Sunan, A. H. A., Yasmin, A. J., Harras, K. A., 2023). The flood of information that reaches us today can be a means of optimizing learning, developing learning tools, and transforming education with the expected outcome that students will be able to compete amid the intense pace of globalization (Atoy Jr. et al., 2020;).

Based on the facts obtained, it is clear that the role and competence of high school/vocational school teachers in South Kalimantan need to be optimized. However, optimizing the performance and competence of high school/vocational school teachers in South Kalimantan requires strategic and comprehensive steps. These steps must be taken by the government as the policy maker and the teachers themselves as the technical implementers in the field.

So far, the South Kalimantan Provincial Government, through the Provincial Education Office, has been very supportive of improving the quality of teacher

performance, especially high school/vocational school teachers. There are various forms of support, including providing a number of training activities through the Education Information and Communication Technology Center (BTIKP), encouraging teachers to participate in various online competency training programs, facilitating permits and scholarships for improving teacher qualifications, providing facilitation related to motivational teachers, providing systemic training, and others. These various forms of support are strengths for the teacher performance improvement program.

The data shows that teachers in South Kalimantan have not yet fully optimized learning synergy by utilizing digital technology devices. This reality can be a gap in the systematic professional development of teachers. Mulyasa (2013) states that the lack of technology-based training and minimal collaboration with higher education institutions has caused stagnation in the pedagogical development of teachers.

The existence of broad potential for cooperation with external parties to improve teacher performance is a strength possessed by South Kalimantan Province. There are at least two groups of external parties, namely educational institutions that can be used as partners to improve teacher performance in terms of knowledge, skills, and attitudes. Second, the business world can support the funding of activities and improve the quantity and quality of educational infrastructure (Selvia et al., 2024).

In the South Kalimantan region, there are a number of public and private universities that have the potential to become strategic partners in efforts to improve the performance of educators. One of the public higher education institutions that has strong potential for such partnerships is Lambung Mangkurat University (ULM). This university has an Educational Technology Study Program under the auspices of the Faculty of Teacher Training and Education, which is relevant to supporting the improvement of teachers' professional capacity. This study program promotes core values in the development of learning and curriculum quality, making it the right partner in supporting educational transformation in the region.

In addition, South Kalimantan has great potential to become a strategic partner for improving teacher performance. Various partnerships to finance various teacher training programs can also be carried out, such as multi-stakeholder collaborations involving a number of companies concerned with improving education. Various joint activities can be carried out, such as in-service training for vocational teachers.

Based on the provisions of the law, 20% of the State Budget (APBN) must be allocated to the education sector. However, in practice, the largest proportion of these funds is still focused on financing the salaries of educators and educational personnel, so that the portion available to support operational activities and educational quality development is limited (Kurniawan et al., 2023). A similar situation is experienced by South Kalimantan Province, where limited education budgets have restricted the scope for implementing teacher performance improvement programs. This situation poses a particular challenge for the South Kalimantan Provincial Education Office in initiating and developing various activities and forms of strategic partnerships aimed at strengthening teacher professionalism in the region.

In the context of improving teacher quality, pedagogical competence is one of the fundamental elements that needs serious attention (Amelia, 2023). Mastery of pedagogical competence enables teachers to perform their roles optimally through comprehensive mastery of the curriculum used, starting from learning materials, from the planning stage, implementation, to evaluation (Nurhasanah et al., 2021; Barkah & Robandi, 2024; Aprianti & Maulia, 2023; Prasetyo & Rahman, 2023). Furthermore, the use of information and communication technology in learning practices expands teachers' capacity to become effective facilitators in exploring students' potential (Susilana et al., 2023; Rosita et al., 2024). Therefore, quality teaching practices cannot rely solely on intuition but need to be

supported by systematic and data-based planning tools to align with the demands of 21st-century learning (Ahad & Widodo, 2024; Lubis, S., 2025).

In training programs, teachers can be involved comprehensively and gradually based on relevant mapping and needs. For example: 1. Training on the development of interactive teaching materials to address challenges that tend to be textual and static (Mukhlisin et al., 2024). Interactive teaching materials can be used to make learning more participatory in line with the characteristics of the current digital generation (Fitra, 2023); 2. Training in various learning models such as cooperative learning, contextual learning, problem-based learning, and project-based learning (Handayani et al., 2023). This can be a quick response to the demands for active and differentiated learning emphasized in the existing curriculum (Makinde et al., 2024). Active learning models can also train students' critical and collaborative thinking skills (Latjompoh, 2021); 3. Improving teacher competence through training in information technology (IT)-based learning media. This can help teachers become a bridge between student potential, the use of digital technology, and industry needs (Dito & Pujiastuti, 2021). This is important considering the digital disparity in various regions of South Kalimantan. Developing IT-based teaching media can also make it easier for students to learn in an adaptive, interesting, and accessible way, especially those in areas with limited facilities; 4. The aspect of evaluation should not be overlooked. Training in the development of evaluation instruments based on higher order thinking skills (HOTS), item analysis, and performance-based evaluation models is key to creating an assessment system that measures not only memorization but also actual competency achievement (Ahmad et al., 2024). This demonstrates efforts to improve the quality of evaluation from quantitative to formative and qualitative.

The predominance of “adequate” competency levels among teachers can be attributed to the uneven exposure to technology-based pedagogical training and the limited integration of ICT into daily instructional practices, despite relatively sufficient academic qualifications and infrastructure. This finding is consistent with previous studies that highlight a gap between teachers' pedagogical knowledge and their ability to operationalize digital technology in classroom contexts, particularly in developing interactive media and technology-based assessments. Compared to earlier research, this study provides a more detailed empirical mapping by combining teacher self-assessment with students' perceptions, thereby revealing inconsistencies between instructional delivery and technology utilization. Theoretically, these findings reinforce the importance of integrating technological, pedagogical, and content knowledge (TPACK) as a unified competency framework rather than treating them as separate domains. Practically, the results contribute to the development of targeted professional development programs, emphasizing applied ICT training, continuous mentoring, and context-based collaboration with higher education institutions and industry to ensure that teacher competency development is both relevant and sustainable.

With these competencies, teachers' performance will be evident during the learning process. The quality of education is largely determined by the quality of teachers' pedagogical competencies. One of the competencies that teachers must have is the ability to develop lesson plans/modules in line with developments in digital and information technology (Yunita et al., 2023; Baharuddin, 2021). Through this process, a teacher can formulate learning objectives, adapt teaching materials and learning methods, utilize technology-based learning resources and media, and develop fair evaluation instruments (Nisa & Hamami, 202).

CONCLUSION

Teacher performance is an important issue that must be a common concern, especially for relevant policy makers such as the South Kalimantan Provincial Education Office. Teachers must perform well because their performance affects student learning outcomes, as teachers are central figures in providing education to students at school.

Teachers are both the designers and implementers of classroom learning. Teachers' teaching competencies will influence students' knowledge, attitudes, and skills. Moreover, facing the challenges of technology in the era of disruption 5.0 requires comprehensive and continuous improvement in teacher performance. Several programs reviewed above as ways to improve teacher competence can be strategic steps to improve the pedagogical competence of high school/vocational school teachers in South Kalimantan Province. These programs target teachers' competencies in developing, selecting strategies, using media, and evaluating holistic ICT-based learning.

The implementation of programs to improve teacher capacity as discussed above has great potential to promote the quality of learning. However, there are several challenges that need to be anticipated. First, the training must be practical in nature, not merely theory-oriented. Teachers need to be accompanied through the process of application in the classroom. Second, a consistent monitoring and evaluation system is needed to ensure that the training truly has an impact on teaching practices. Third, cooperation with universities must be oriented towards field needs, not merely ceremonial activities.

The teacher performance improvement program is a strategic program whose implementation requires adequate funding. The implementation of this program may involve many parties. Therefore, in order to improve the competence of high school/vocational school teachers in South Kalimantan, it is necessary to enrich their competence based on TPACK, which integrates digital technology, pedagogy, and balanced, comprehensive, and impactful learning content. Additionally, teacher performance improvement can leverage external collaborations such as universities, periodic performance evaluations based on digital portfolios, and performance incentives in the form of scholarships, awards, and further studies for high-achieving teachers.

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