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TEACHER COMPETENCY IMPROVEMENT MANAGEMENT MODEL THROUGH HYBRID TRAINING IN THE IMPLEMENTATION OF DEEP LEARNING IN NUMFOR PAPUA

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Abstract

The progressiveness of the quality of education in formal educational institutions is implemented through a number of strategies, namely strengthening the readiness of new students, improving teacher competence, updating the curriculum, improving the quality of learning and evaluation of learning outcomes, providing adequate teaching materials, and providing adequate learning facilities. The data analysis techniques implemented involve quantitative and qualitative approaches. Quantitative analysis was carried out by comparing the results of the pretest and posttest using descriptive statistics to measure the progressiveness of the population of competencies of 13 teachers of SMPN 3 Numfor Barat and 13 teachers of SMKN 3 Kemaritiman Biak after training. Partner teachers in Numfor Papua face a number of significant challenges in improving the quality of learning. One of the main problems is the low understanding of the innovative deep learning approach, focusing on comprehensive student involvement in the learning process in order to develop critical, creative, and collaborative thinking skills. research findings indicate that a number of 20 teachers at SMPN 3 and SMKN Kemaritiman Numfor Papua experienced progressive abilities in designing and implementing deep learning strategies that focus on critical, creative, and joyful learning thinking and the implementation of deep learning, especially joyful learning, teachers are able to create a dynamic and meaningful learning atmosphere for students.

Keywords : ***Hybrid. Deep Learning. Teacher Competence.***

I. INTRODUCTION

a. Background

Teacher training management in Indonesia still faces a number of challenges, including limited access to quality training, lack of supporting facilities, and limited funding for training programs. Collaborative research by Yusuf and Rahayu (2023), only around 50% of teachers in remote areas have had the opportunity to take part in professional training in the last five years. Apart from these conditions, there is a gap between urban and rural areas in access to technology-based and factual training identified in Biak Numfor Regency, Papua, the challenges of teacher training management are more complex. Linear factual conditions at the locus studied, research findings by Lestari et al. (2022), geographical factors that are difficult to reach and limited infrastructure are the main obstacles to the progressivity of teacher competence. The findings of the study were that only around 30% of teachers in the area had access to digital-based training. Apart from these conditions, limited internet networks and the lack of competent trainers further exacerbated the situation. Linear factual conditions that occurred in Biak Numfor Regency, that geographical conditions made it difficult to implement internet-based hybrid training. A number of factors such as limited access to education, lack of qualified teaching staff, inadequate infrastructure, and challenging geographical conditions have exacerbated this situation (Ramadhan, 2024)

As an alternative solution to this problem, the government and educational institutions in Papua have begun implementing innovative strategies, including community-based training and mentoring programs by more experienced senior teachers. The program is targeted at improving teaching skills and introducing technology in gradual learning. The educational system serves a unique role in facilitating the learning process. Teachers are not only expected to master the subject matter, but also to master the necessary skills (Harapan, 2022). Through a more

inclusive and local needs-based approach, it is hoped that the competence of teachers in remote areas such as Numfor can be significantly improved.

Based on the above studies, it can be concluded that the progressiveness of teacher competencies, focusing on the integration of technology and deep learning methods, is still a major challenge in the world of education. Thus, more intensive and practice-based training programs are needed to ensure that teachers have the skills needed to create effective and meaningful learning. Previous studies have reported mixed evidence concerning the role of participation mode in SHC. While some studies documented significant differences between on-site and remote students' learning experiences in SHC (eg Crary et al., 2021; Raes, Vanneste et al., 2020), others found no significant differences (eg Tamsukhin et al., 2023; Yang et al., 2019). There could be three potential reasons for these mixed results. First, some studies were based on synthetically created settings or one-off interventions, while others were conducted in authentic contexts. Conducting research in authentic contexts is important because the SHC would then be better integrated into everyday school activities and pedagogical, technological and social affordances would have been adopted by teachers and students. However, there is a challenge to create comparable conditions in such authentic settings.

One of the main challenges in SHC is to provide suitable learning activities for both on-site and remote students which lead to equivalent learning outcomes (Beatty, 2019). It still remains open which types of learning activities are typically implemented in SHC and which pedagogies work best (Zydney et al., 2019). More studies are needed that look into the details of pedagogical approaches in SHC. We, therefore, applied the ICAP (Interactive, Constructive, Active, Passive) framework (Chi & Wylie, 2014) in the present study to get a clearer picture of what is going on in the SHC and to model the impact of different types of learning activities on students' perceived learning

Teachers play an important role in the learning process, where teachers act as facilitators who facilitate the learning process through a number of learning methods that seek to foster students' thinking and activity skills. (Jaya, 2016). Professional teacher competencies are linear abilities and skills that educators must have to carry out their duties effectively and efficiently. These competencies include mastery of subject matter, understanding of student characteristics, the ability to design and implement learning, and the ability to evaluate learning outcomes. Learning outcomes are a marker of every change made by students during the teaching and learning process, these learning outcomes are obtained after educators conduct evaluations or reflections in both the cognitive, affective and psychomotor domains (Pohan, 2021)

A professional teacher is a teacher who has the ability or a set of competencies in carrying out his/her duties as a teacher or educator, according to Law Number 14 of 2005 concerning teachers and lecturers in Chapter IV, Article 10, paragraph 91, teacher competencies include pedagogical competencies, personality competencies, social competencies, and professional competencies obtained through professional education.(Pd, 2021). Based on the Regulation of the Minister of National Education Number 16 of 2007 concerning Academic Qualification Standards and Teacher Competencies, there are four main competencies that educators must have covering a number of important aspects. In the background, referring to the most recent research findings 2024-2025

*Linear*fundamental factors, Kaleka et al. (2022), teachers play a significant role in the scope of education and the manifestation of tasks in the field of learning and teachers should improve their qualifications and competencies (Uspayanti et al., 2022). This condition is supported by the opinion of Sa'o et al. (2023), teachers are obliged to improve their competence and qualifications for the progressiveness of education. Based on Hayati et al. (2024), the development of human resource competencies in the field of education plays a significant role in improving the quality of education. This condition indicates that the progressiveness of the quality of learning is not only based on material aspects but also on the progressiveness of the teacher's capacity as an educator and increasing the effectiveness of the learning process, teachers are expected to be creative, innovative, and have qualified competencies (Adji et al., 2022).

Despite these conditions, Sumar & Sumar (2019), focus on the importance of implementing a continuous professional development program for teachers, especially through the progressiveness of zoning-based learning competencies. Rezaldi (2021), the urgency of developing teacher competencies in the digital technology era towards the quality of learning. Thus, the progressiveness of teacher competencies becomes a strategic fundamental in creating more effective learning.

*Linear*The rapid development of global technology requires efforts to linearize the quality of human resources so that technological progress is linear. Universities are often considered the intellectual center of society and must be sensitive to strategic and actual problems that develop. Winata et al. (2020), lecturers are not only expected to excel in learning on campus but must be able to integrate their abilities with partners, namely teachers in schools at both elementary and secondary levels. This condition is carried out to support the implementation of the tri dharma

of higher education and prepare teachers to face the challenges of learning in the era of global technology. The management of the Principal in improving teacher competence also plays a significant role in the progressiveness of the quality of education. Thus, collaboration between lecturers, Principals, and teachers needs to be improved so that the quality of education can be continuously linearized. Pedagogical competence is one of the basic competencies that teachers must have, especially teachers in formal educational institutions, to create meaningful, educational, and linear learning for student needs.

These competencies include the ability of teachers to understand the characteristics of students, design and implement learning, conduct evaluations, and develop students' potential optimally. However, what was identified in Numfor Papua, there are still a number of challenges that indicate that the pedagogical competence of teachers in formal educational institutions needs to be improved in order to face the demands of modern education. References include international journals. Findings in Numfor Papua indicate the progressiveness of post-test participant scores of up to 45% compared to pre-test scores, reflecting success in helping junior high school teachers understand and apply the deep learning approach. Macro understanding indicates that the training has a positive impact on the development of teacher pedagogical competence. Through a better understanding of the deep learning approach, teachers are able to design more meaningful, relevant, and linear learning for students' needs. Focusing on the joyful learning aspect during training has proven effective in creating a more dynamic learning atmosphere, increasing student motivation, and encouraging active involvement in learning. These findings indicate that the combination of deep learning and joyful learning can be a very effective strategy to create meaningful and enjoyable learning experiences. It is expected to be an inspiration for the implementation of similar activities in other regions to support educational progress. These conditions are linear Kant et al., that a number of factors that influence the effectiveness of training are a number of factors such as motivation, attitude, emotional intelligence, management and co-worker support, training style and training environment, trainer open-mindedness, job-related factors, self-efficacy, and basic abilities.

The deep learning approach is a learning model that is oriented towards comprehensive understanding, allowing students not only to memorize information but to explore knowledge meaningfully through simultaneous learning experiences. This approach encourages students' emotional and cognitive involvement, so that they can interpret the subject matter more constructively (Kompas, 2024). This learning model is targeted to substitute the conservative paradigm that often only focuses on memorizing and repeating information with more reflective learning and based on understanding construction (Suwandi, 2024). This approach supports the opinion of Atmojo et al. (2023), learning must be able to adapt to the ongoing changes of the times by implementing linear development methods, including integrating technology in the process.

Previous research findings, teacher training management in Biak Numfor Regency has not been implemented effectively, has implications for teacher competence, especially teacher competence in implementing the concept of deep learning and implicatively, the impact results in student learning outcomes that are not yet linear to expectations from the established plan. Thus, it is necessary to produce a teacher training management model to improve teacher competence in implementing deep learning in Biak Numfor Regency.

The deep learning approach requires a longer duration and flexible methods, but these factors are often a challenge in an education system that prioritizes efficiency and achieving certain academic targets. The model focuses on meaningful learning that is expected to be able to change student behavior permanently and bring positive values into everyday life. The implementation of deep learning in several countries has indicated significant results in increasing student understanding and engagement.

Research supporting the implementation of deep learning in education provides hope that this approach can be an alternative solution to improve the quality of Indonesian education and this context is considered important for educators and stakeholders to continue to explore strategies for implementing this model in a macro and effective manner. Government support in the form of providing resources, infrastructure, and teacher training is needed so that deep learning can be implemented evenly, both in schools and urban and remote areas.

Partner teachers in Numfor Papua face a number of significant challenges in improving the quality of learning. One of the main problems is the low understanding of the innovative deep learning approach, focusing on comprehensive student involvement in the learning process to develop critical, creative, and collaborative thinking skills. Apart from these conditions, a number of teachers still have difficulty designing technology-based learning due to limited technical skills and lack of access to supporting facilities. Another obstacle is the lack of time and guidance to explore new learning methods, so they tend to stick with conventional methods that are less relevant to the needs of students in the digital era.

This research is targeted to be able to improve the pedagogical competence of teachers in Numfor Papua through the implementation of training implementing a deep learning approach. The specific objective is to equip

teachers with skills in designing, implementing, and evaluating learning strategies that can encourage students to think critically, creatively, and enjoy joyful learning. It is hoped that these activities can create positive changes in classroom teaching practices, improve the quality of learning, and ultimately have a significant impact on student learning outcomes. With the right collaboration and support, this research is expected to become a learning model that can be widely adopted at a number of levels of education.

Macro understanding indicates that the deep learning model has the potential to bring significant changes to Indonesian education. By providing deeper and more meaningful learning experiences, students are expected to be able to face global challenges and increasingly complex world developments. This study is targeted to analyze the potential and challenges of implementing the deep learning model in Numfor Papua and provide practical recommendations for its implementation in primary and secondary education.

Based on Raup et al. (2022), one of the effective strategies to improve teachers' pedagogical competence is through the implementation of an innovative deep learning approach. However, the implementation of this approach requires a comprehensive understanding from teachers regarding strategies for designing learning that can develop students' critical, creative, and analytical thinking skills. The facts identified in Numfor Papua still show gaps in teachers' understanding regarding the implementation of this learning model, so intensive training is needed to overcome this.

Andriana (2021), strong pedagogical competence includes the ability of teachers to establish effective communication with students. However, a number of teachers identified in Numfor Papua still face difficulties in creating supportive interactions and come from different backgrounds. This condition indicates the importance of training in understanding child psychology and inclusive classroom management. Deep learning-based learning requires teachers not only to master the material but also to have the skills to create deep and meaningful learning experiences for students. Thus, training and professional development of teachers are fundamental factors in ensuring the successful implementation of this approach (Hattie, 2008).

Wahyuni & Berliani (2018), a number of teachers in formal educational institutions face obstacles in understanding the characteristics of students comprehensively related to differences in learning styles, abilities, and emotional needs of students. This condition is reflected in a number of teachers in formal educational institutions in Numfor Papua who still implement conventional learning and pay less attention to variations in learning approaches. The logical consequence is that students' potential is not fully actualized and the learning atmosphere becomes less conducive.

Despite these conditions, Nurfitriany and Zamil (2020), teachers' ability to integrate technology into the learning process still needs to be improved, especially in the digital era. The conditions that occurred at the research locus, although a number of schools already had adequate technological facilities, some teachers at formal educational institutions in Numfor Papua still felt less confident in utilizing technology to support learning. This condition indicates that training and assistance related to mastery of learning technology are very necessary.

II. METHOD

The method used in this research activity includes three main stages, namely counseling, this stage is targeted to provide participants with an understanding of the deep learning approach through lecture, discussion, and question and answer methods. All research activities carried out were determined at SMPN 3 Numfor Barat and SMKN 3 Kemaritiman Biak Numfor with the argument of ease of obtaining primary and secondary research data because at the same time, the researcher was part of the teachers at both schools. This activity is designed to increase the knowledge and insight of the target group regarding the concept and benefits of the approach used. Training is a stage where participants are given the opportunity to design learning by implementing a deep learning approach. Apart from these conditions, they are also invited to practice the strategies that have been designed to hone their abilities in implementing deep learning-based learning. Mentoring is a stage that focuses on consultation activities to help participants solve problems that arise when implementing a deep learning approach in schools. This mentoring is targeted to ensure the sustainability and effectiveness of the implementation of the strategies that have been learned.

The implementation of the activity began by providing a pre-test of 30 multiple-choice questions to identify teachers' initial abilities related to the implementation of the deep learning approach in learning. Thus, the material on the principles and strategies of deep learning-based learning was delivered face-to-face by presenters consisting of educational technology experts and pedagogical experts at formal educational institutions. The delivery of the material was measured through interactive lectures followed by a question and answer session. Teachers were then given tutorials and practical training in implementing deep learning strategies in designing creative, fun, and relevant learning to students' needs. The training and mentoring were carried out during three offline meetings,

with the first meeting focusing on the introduction of the concept of deep learning and its implementation, the second meeting on the practice of preparing deep learning-based learning plans, and the third meeting on mentoring and simulation of learning implementation in the classroom.

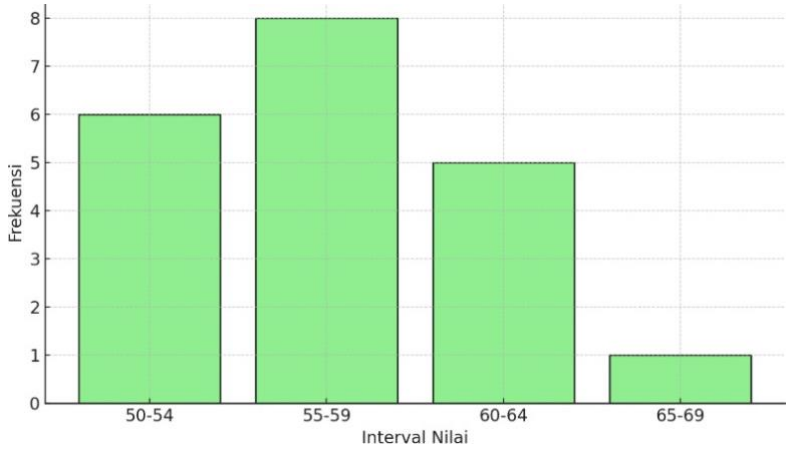
The evaluation stage is carried out after the teacher has prepared a deep learning-based learning design, the teacher fills out an open questionnaire to evaluate the success of the program. Indicators of success include more than 50% of teachers who are able to design deep learning-based learning independently and the successful implementation of learning simulations with positive responses from students who feel that learning is more interesting and meaningful. Regardless of these conditions, a posttest in the form of 30 multiple-choice questions is given to measure the progressiveness of teacher skills in implementing the deep learning approach in classroom learning.

The data analysis techniques implemented involved quantitative and qualitative approaches. Quantitative analysis was conducted by comparing the results of the pretest and posttest using descriptive statistics to measure the progressiveness of the competency of 13 teachers of SMPN 3 Numfor Barat and 13 teachers of SMKN 3 Kemaritiman Biak after the training. The percentage of teachers who successfully designed deep learning-based learning designs is categorized as an indicator of program success, with a target of more than 50% of teachers being able to do so. Observations during mentoring and trials were also analyzed to evaluate teacher involvement and student responses to deep learning-based learning. The combination of these analyses provides a comprehensive description of the effectiveness of the training and its implementation in the classroom.

III. RESULT AND ANALYSIS

The initial stage of identifying mastery of the material presented is carried out by a pretest. The test is in the form of 30 multiple-choice questions of linear pedagogical competency indicators by implementing deep learning. Based on the results of the pretest carried out, the following data were obtained:

Pretest Data Image



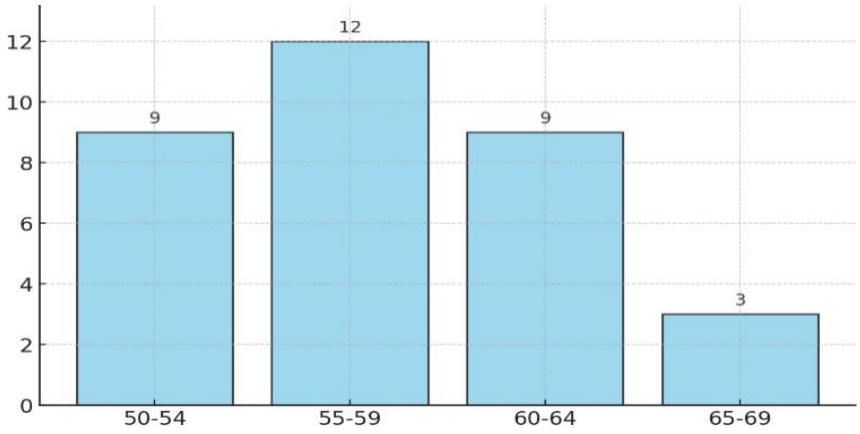
The histogram graph indicates the distribution of the scores of participants in the implementation of deep learning training to improve teacher pedagogical competence in Numfor Papua. The majority of participants scored in the interval 55-59 with the highest frequency of 8 people, the intervals 50-54 and 60-64 had the same frequency of 6 people. The interval 65-69 had the lowest frequency, which was 2 people, indicating that only a few participants achieved the highest score. This distribution reflects that the majority of participants have a fairly good understanding of the material, but there is an opportunity to increase the number of participants with higher scores by strengthening the training method.

Counseling stage, teachers are introduced to the basic concept of deep learning, focusing on the importance of learning that encourages students to think critically, creatively, and understand the material comprehensively. Through lecture, discussion, and question and answer methods, teachers gain an understanding of deep learning strategies that can create more meaningful and relevant learning experiences for students. The counseling also focuses on supportive classroom conditions, including joyful learning elements that can strengthen the implementation of deep learning in the school environment. Participants begin to understand that a pleasant learning atmosphere is a vital component in building student engagement and helping to achieve higher learning targets.

The training stages focus on participants' ability to translate deep learning principles into classroom learning planning and implementation. Teachers are trained to design Learning Implementation Plans by integrating linear strategies, namely problem-solving-based approaches, interactive discussions, and collaborative learning. Regardless of these conditions, the training focuses on the importance of adopting joyful learning elements in learning through educational games, creative activities, and the use of visual aids or technology and learning simulations carried out during the training, participants indicated the progressiveness of their ability to design student-centered and enjoyable classroom activities. Teachers also began to realize that learning that involves positive emotions and active student interaction can improve understanding of the material being taught.

The mentoring stage is carried out through individual consultations targeted at helping teachers overcome challenges that arise during the implementation of deep learning in the classroom and the consultation session, teachers are given the opportunity to discuss specific obstacles, namely the linearity strategy of learning strategies with student characteristics or improving less than optimal learning designs. The focus of the discussion includes strategies for implementing the joyful learning approach as an integral part of the deep learning strategy. The mentoring provides significant support for teachers, especially in increasing self-confidence to create comprehensive and enjoyable learning consistently.

Post-test Data Image



The post-test image indicates the frequency progression at each value interval compared to the pretest. The 55-59 interval still has the highest frequency with 12 participants, while the 50-54 and 60-64 intervals increased to every 9 participants. The 65-69 interval also increased, although it only reached three participants. This progression reflects that the training has succeeded in increasing participants' understanding of macro understanding indicated by a higher value distribution compared to the pretest. However, the majority of participants remain in the middle interval, namely 50-64, indicating the potential to further improve the results of the highest interval 65-69 through material enrichment and more intensive mentoring. Based on these data, there is a 45% progression before and after participating in the training activity.

Progressive training of teacher pedagogical competence through the implementation of deep learning learning approaches has had a significant impact on participants. A total of 20 teachers at formal educational institutions in Numfor Papua participated in the activity, designed to strengthen understanding and skills in implementing a learning approach oriented towards comprehensive understanding, critical thinking, and meaningful learning. The training includes counseling, practical training, and consultation assistance focused on the implementation of deep learning principles, with a special emphasis on the joyful learning aspect.

Based on the theory of implementing a deep learning approach in teacher training in Numfor Papua, it has been proven effective in improving pedagogical competence by encouraging active student participation and personalized learning. Training programs that integrate deep learning can help teachers develop strategies to actively engage students, thereby improving pedagogical competence (Agyeman, 2024). Regardless of these conditions, deep learning-based teaching strategies in groups can be used to improve experimental training by diagnosing student abilities before class and grouping linear capacities (Mou et al., 2022).

However, the challenges of curriculum adaptation and student potential development still need to be a linear concern in overcoming the challenges of curriculum adaptation and student potential development in traditional training programs (Agustina et al., 2019). Balancing these elements can produce more comprehensive pedagogical skill progression.

As an alternative solution to the challenges in the progressivity of teacher professional competence, especially in implementing the deep learning method, one solution that can be implemented is Hybrid Collaborative-based training. This approach combines face-to-face learning (offline) and online learning in a collaborative ecosystem that allows teachers to develop their skills more effectively and flexibly. Hybrid Collaborative training emphasizes a combination of theory and practice, as well as active interaction between participants.

The majority of studies were conducted in higher education contexts, while research in primary or secondary education is still scarce (Raes, Detienne et al., 2020). Empirical evidence on the role of participation mode (on-site vs. remote) in SHC is also inconclusive, with studies reporting significant differences between on-site and remote students' learning outcomes or no differences at all. In a study of experimental designs in subjects in the context of higher education, Raes, Vanneste et al. (2020) investigated the effects of different learning settings, purely face-to-face, purely virtual, SHC-on-site, and SHC-remote on students' engagement, intrinsic motivation, and learning achievement. The findings indicated that the remote SHC environment was the most challenging environment to learn.

Peer engagement and intrinsic motivation, which in turn, were positively correlated with learning achievement scores, were the lowest in this group. In the context of secondary education, Shi et al. (2021), examined the relationship and underlying mechanisms between SHC and students' cognitive engagement, considering the mediating role of motivation. The research findings indicate the importance of the pedagogical elements of SHC (i.e. the teaching strategies implemented), which were shown to be strong predictors of students' extrinsic and intrinsic motivation and deep cognitive engagement. Furthermore, the authors highlighted the issue of low cognitive engagement of students in remote areas. Crary et al. (2021), identified significant differences in the actual experience of classroom engagement between on-site and remote students, favoring on-site students. Remote students struggled to actively participate and an "us versus them" feeling was evident between the two groups.

Yang et al. (2019) explored the effectiveness of implementing SHC in primary education in a two-year project and identified that the experimental group (SHC) outperformed the control group (traditional teaching) in a post-test of academic achievement. Unlike other previous studies, they did not identify significant differences in perceived SHC efficacy between on-site and distance learning. Similarly, students in Tamsukhin et al.'s (2023) study rated their on-campus and distance learning experiences similarly. Raes (2022) investigated the effect of attendance level (on-site vs. remote, remote with interaction, remote without interaction) on conceptual and affective outcomes and did not identify significant differences between on-site and remote students in conceptual understanding factors; however, there were significant differences regarding affective engagement in supporting on-site and remote students who were able to interact. Teachers can implement a number of strategies to foster students' sense of social presence including the use of online quizzes and polls throughout the lesson (Raes, Detienne et al., 2020), heterogeneous group work (Zydney et al., 2019) and the use of multi-screen projections (Szeto & Cheng, 2016) or 360-degree cameras (Tamsukhin et al., 2023).

Related to this last factor, the necessary technological infrastructure must be provided at the educational policy-making level. Since SHC is still a new learning approach, teachers also need support in designing and implementing effective SHC in the form of professional development courses provided by schools and teacher education institutions. Future research could investigate how teachers can be prepared (e.g. in professional development courses) to design and implement effective SHC. In the short term, top-down theoretical approaches, such as the ICAP framework or Bloom's taxonomy revised by Krathwohl (2002) can be used as a basis for designing lesson plans. In the long term, however, there should be a broader participatory design approach that involves all relevant stakeholders from an early stage and encompasses the pedagogical, social and technical capabilities unique to the real-world environment in which SHC is implemented.

Understanding the theory and strategies of deep learning, teachers can improve the effectiveness of teaching, motivate students, and help them develop critical and creative thinking skills that are much needed in the digital era and in Indonesia, especially in remote areas such as Numfor Island, Papua, limited access to professional training is a major obstacle to the progress of teacher competence. Lack of facilities, limited quality training, and limited educators who are competent in learning technology are challenges that need to be overcome immediately. Thus, innovation is needed in the strategy for the progress of teacher competence that can reach remote areas without sacrificing the quality of training. Hybrid training, which combines online and offline learning methods, is a potential solution to improve the professional competence of teachers in areas with limited access. Hybrid learning creates a flexible learning atmosphere that can be adjusted to the needs of students (Chakim & Psi, tt).

Hybrid learning combines offline and online methods, known as blended or hybrid learning. Teachers need to overcome new challenges in online learning, while students benefit from the flexibility and accessibility provided

by online learning (Uyun & Warsah, 2021). The implementation of hybrid learning methods is a step forward to achieve effective and flexible learning, ensuring that education remains relevant and adaptive to changing times.(Aziz & Wanto, 2023). The model allows teachers to obtain training materials flexibly through digital technology, while also receiving direct guidance in face-to-face sessions. Thus, teachers can develop their skills in implementing deep learning without being constrained by distance and infrastructure limitations.

IV. CLOSING

The conclusion obtained is based on research findings indicating that a number of 20 teachers at SMPN 3 and SMKN Kemaritiman Numfor Papua experienced progressive abilities in designing and implementing deep learning strategies that focus on critical, creative, and joyful learning thinking and the implementation of deep learning, especially joyful learning, teachers are able to create a dynamic and meaningful learning atmosphere for students.

Collaboration between teachers, principals, and education offices is also fundamental to the success of deep learning implementation. Teachers need to continue to improve their competencies through ongoing training and the development of innovative learning media, while principals are expected to provide support facilities and appreciation for best practices implemented by teachers. Education offices can support the program by formulating policies that encourage widespread adoption of deep learning, providing a budget for technology procurement, and ensuring ongoing mentoring and supervision. Through optimal synergy between several parties, deep learning has a significant impact on creating dynamic, meaningful, and relevant learning experiences for students.

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