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Teacher Performance Assessment System: Support Teacher Professionalism Based on Artificial Intelligence (AI) Technology in Android Platform

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ABSTRACT

This study aimed to know the effectiveness of teacher performance assessment system based on artificial intelligence technology in Android platform to improve the: 1) ability to develop learning innovations; 2) ability to conduct Class Action Research; and 3) scientific writing skills of class action research implementation results. The research was conducted to develop the competence of teachers in achieving their professionalism. This research was development research. The development model adopts Dick & Carey with these stages: 1) analyze; consist of three steps: analyzing the need to identify the needs to identify goals, analyzing instructional analysis, and analyzing learners and contexts, 2) developing, 3) design, 4) implement procedural steps after performing the needs analysis stage, and 5) evaluation. Products developed are in the form of applications in the android platform. The data was obtained through online application trials to respondents and analyzed descriptively qualitatively. The results show that the developed applications are effective in improving the teacher's ability to: 1) bring up ideas of learning innovation, 2) conduct class action research, and 3) improve their skills to compile scientific articles from their research result. The overall improvement strongly supports teacher performance in sustainable professional programs.

Keywords
Performance Assessment; Teacher Professionalism; Artificial Intelligence Technology

Introduction

The imbalance needs and availability of teachers cause a domino effect of educational problems. This issue occurs to both classroom teachers and subject teachers. It happens continuously until the main obstacle both at the district/ city and provincial level, and national education units. Such conditions have an impact on the stalled development of sustainable teacher professionals. Indonesia and some other developing countries in Asia feel the impact of the imbalance needs and availability of teachers (Blomeke, Suhl, &Dohrman, 2013; Cher Ping Lim, 2013; Dobinson, 2012). The Government found some solutions to handle the problems by creating double classes, one-stop schools, additional authority, and other strategies. However, the problems still have not been solved.

The local Government as the spearhead who controlling the amount needed for educators and educational personnel have issued several policies as one of the implementation parts of the Joint Regulation of 5 Ministers decree in 2011, especially in article 3 paragraph 1. Some of the policies that have been created as follows:

1. The Minister of National Education ceases some or all financial assistance of the educational function.
2. The Minister of State for The Utilization of State Apparatus and Bureaucratic Reform based on recommendations as referred to in paragraph (1) postponed the provision of civil servant teacher formation.
3. The Minister of Finance based on recommendations as referred to in paragraph (1) may delay the distribution of balanced funds.
4. The Minister of Home Affairs based on recommendations as referred to in paragraph (1) provides poor performance assessment.

The policies made by the Local Government are intended to achieve measurable adequacy, relevance, and equality to improve education services. Increasing the numbers of teachers in urban areas and decreasing them in rural areas can be avoided through the policy-making that has been made.

The quality of education services provided by educators (teachers) and education personnel indirectly affects the teachers' performance. The increasing numbers of subject teachers in an area

cause teachers can not fulfill the minimum of 24-hour teaching in a week. This condition forces them to seek additional teaching hours in some schools. However, some areas where have teachers whose lack of experience, facing different condition. They must teach several subjects at the same time to fulfill sufficient numbers of teachers in a school. This condition will impact the teacher's performance assessment. They will difficulty in developing their skills, competencies (pedagogic and professional), career, rank, and position.

Teacher performance will indirectly impact the learning progress of learners (Bing &Zhiling, 1991). Teachers who have excellent professional and pedagogic competencies will help students develop their skills and competencies to compete globally. Teachers who are personable and well-behaved and have global knowledge can be role models for students (Hakim &Dalli, 2016). However, not all teachers can be monitored for their performance as educators in schools, laboratories, or academic forums. Teachers' performance can be seen on their credit score assessments. Each province through the Education Quality Assurance Agency (in Indonesia it is called LPTK) also conducts Teacher Performance Assessment. However, the results have not shown a truly measurable performance and illustrate the achievement of a sustainable professional program.

Scientific seminar activities, learning innovation competition, selection of best teachers and education personnel, further study scholarship offers, Training on the preparation of Class Action Research proposals, and lesson studies have been organized and facilitated by the Education Office and LPTK partners. However, not all of these activities can boost the performance of teachers. An integrated system is strongly needed to monitor teacher performance so that it can be shown which required improvement of teacher professionalism.

The researcher found the application development from the previous study in 2019 that guided teachers in conducting the sustainable professional development program. It showed that many teachers experiencing obstacles in the development of learning innovations and the implementation by conducting Class Action Research. That experience is as difficult as a teacher in the classroom who manages and supports students' learning activities inside and outside the classroom. The result of research conducted by Dini, Utami, and Bambang (2017) on English teachers shows the same thing. Teachers are utilized by teacher deliberation subjects forums, seminars, competitions and workshops, and training to improve their performance to support the sustainability profession. However, not all of them take a chance and advantage of these forums so that their performance can not be controlled. Some active participants only focus on one of the closest areas from LPTK or institutions that offer sustainable professional development support activities.

Recently, the Directorate General of Teachers and Education Personnel has provided a Sustainable Professional Program Management Information System. Each teacher is strongly advised to have an account and username to log in to the system. It is also integrated into the teachers and educational staff homepage. However, they still can not access the website due to the process of data merger from basic education data to that webpage has not been completed yet. This condition affects how they can choose the sustainable professional program needed.

Nowadays, we are in Industrial Revolution Era 4.0 which allows people to access information through digital technology and big data. All things can be informed anytime and anywhere with the condition of internet network facilities. Moreover, the development of artificial intelligence and mobile learning activities, especially the Android platform, makes it possible to help things that cannot be done manually. However, the development of such technology has not been fully utilized by aspects of education and learning including teacher performance assessment. Based on these ideas, innovation is needed to utilize the role of artificial intelligence technology to support teacher performance assessment systems.

Literature Review

Assessment is the stage to know the availability of an activity or process. It is also an effort to collect information as data, data processing process, analysis, and interpret it as a consideration to be concluded. Teacher Performance Assessment is regulated in the minister decree of empowerment of state apparatus and bureaucratic reform Number 16 the year 2009. Assessment of teacher performance is the assessment of every aspect (item) of the main task of the teacher in the framework of career development, position, and rank.

The implementation of the main task of the teacher is closely related to the ability of a teacher in the mastery of knowledge, application of knowledge and skills, as a required competency under the mandate of the Minister of National Education Regulation No. 16 of 2007 concerning Academic Qualification Standards and Teacher Competencies. Mastery of competence and application of knowledge and skills of teachers, greatly determine the achievement of the quality of the learning process or mentoring of learners, and the implementation of additional tasks relevant to the school/madrasah, especially for teachers with additional tasks. The teachers' performance assessment system covers an assessment system that is designed to identify teachers' ability in teaching through measurable competency based on their performance and duties.

Assessment of teacher performance is conducted by the principal or supervisor to measure the competence of teachers (Fien, 2010). The function of teacher performance assessment is to assess the teacher's ability on applying their competencies, skills required in the learning process, mentoring, or the implementation of additional tasks that is relevant to the function of the school. It is also used to calculate the credits earned by teachers for the performance of learning, mentoring, or the implementation of additional tasks relevant to the functions of the school in that year.

Education is the process of obtaining information or knowledge for a better goal. The educational process includes the transfer of knowledge, skills from one person to another with and or without intermediary media. Nowadays, technological advances have affected people's life. One of the developments of technology is on the communication system which makes people communicate with others easily, work together, create learning and teaching systems, and learning management strategies anytime and everywhere.

Learning in the 21st century has a different perspective. Learning can be done anywhere, at any time, on any topic (theme) that is realized or will not affect the formation of a learning style. Great learners are the result of the great work of great teachers. Student achievement is influenced by many factors. The most important influencers are inspiring teachers and have unlimited access to information. This is one of the teachers' types in the 21st-century era.

Teachers in the 21st century should be able to know the students' needs, prepare and equip them to face future challenges. Some teachers feel that this responsibility quite hard for them. A qualified teacher professional development program is one of the media to prepare their teaching quality. Development programs should incorporate the use of technology integration in teaching (Jan 2017).

The demands of the 4.0 industrial revolution and the skills in the 21st century must be considerations of teachers in determining their strategy patterns, methods, and or learning models in or out of the classroom. Students are facilitated to explore their abilities and competencies with access to as much information as possible. Teachers as facilitators direct the students to determine the learning style according to their intrinsic motivation so that information or knowledge is discovered by themselves through a series of learning activities that have been designed by the teacher.

The era of industrial revolution 4.0 allows learners to host technology and digital content producers. Students are more friendly and familiar with the development of new and best technologies although rarely use them for communication purposes with friends, family members, and communities. Each student has a technological device (gadget) that can be used to produce blogs as a communication media worldwide. However, in the classroom teaching-learning activities, teachers tend to ask students to shut down their gadgets and focus on critical thinking skills through discussion forums among peers.

Activities can be continued with the assignment strategy of creating a creative blog that reviews stories and opinions on a topic that is being discussed so that it will foster a sense of pride in students when able to share information with others. Such conditions make it possible for professional teachers of the 21st century and the era of industrial revolution 4.0 as agents of change (Badley, 2006).

The term artificial intelligence refers to human intelligence embedded in machines and given programs to mimic the human motion and its actions. The term AI can also be applied to any machine that exhibits properties associated with the human mind. The processes are including on learning (obtaining information and rules for using information), reasoning (using rules to reach a definite conclusion estimate), and self-correction.

Artificial intelligence is based on the principle that human intelligence can be defined in such a way that machines can easily replicate it and carry out tasks, from the simplest to the more complex. The goals of artificial intelligence include learning, reasoning, and perception. This understanding will always be dynamic and shifted following the development of technology. AI technology continues to evolve so that many human roles are replaced by ai-tech machines.

AI has 2 categories that are weak and strong. Weak AI, also known as narrow AI, is an AI system designed and trained for specific tasks. Virtual personal assistants, like Apple's Siri, are a weak form of AI. While strong AI, also known as general artificial intelligence is an AI system with human cognitive abilities in general. When presented with special tasks, powerful AI systems can find solutions without human intervention (www.cnbcindonesia.com).

AI characteristics that combine technology and algorithm flow developed from simple algorithms to complex algorithms allow the development of AI for the field of Education. A series of tasks planned by teachers and to be completed by learners can be presented in the Learning Management System (LMS). Assignments requiring manual roles by teachers can be replaced by the existence of AI (Popenici &Kerr, 2017). AI can be presented in the form of software or application systems integrated with the database that has been prepared by the program developer. The use of AI for educational purposes has been applied in some countries and has varied results. AI has helped teachers carry out routine tasks manually to be more systematic (Timms, 2016; Barnes et al, 2017; Nicols &Holmes, 2018; Karsenti, 2019; Mohammed, 2019; Walkington &Bernacki, 2019).

Methods

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Methodology (Times New Roman, bold, 12)

This research is development research. The design development model adopts Dick &Carey model (2015) which includes stages: 1) analyze which contains three steps, namely: analyzing the need to identify goals (assessment needs to identity goals), analyzing instructional analysis, and analyzing learners and contexts, 2) developing, 3) design, 4) implementation (implement) procedural

steps after performing the needs analysis stage, and stage 5) evaluation (evaluate).

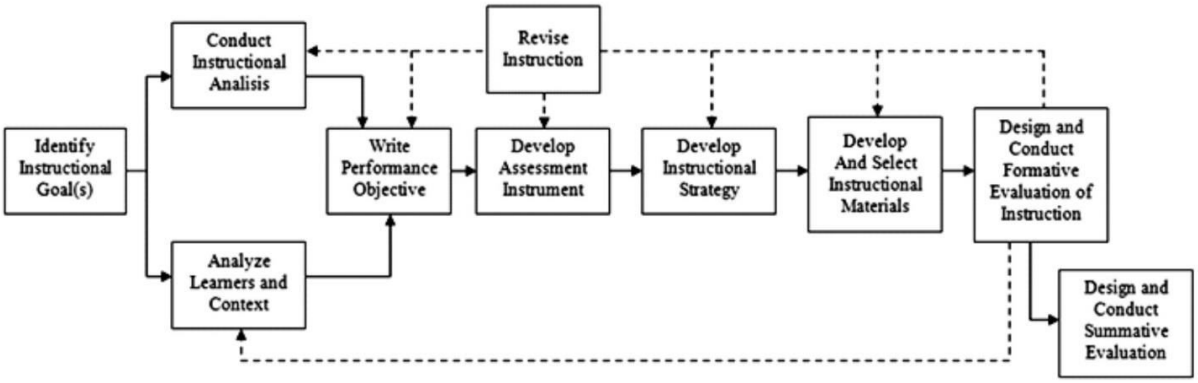

Figure 1. Dick &Carey development design stage flow (2015)

Product tests were conducted in three groups (1) elementary school teachers (class teachers), (2) junior high school teachers (subject teachers), and (3) high school/vocational teachers (subject teachers). To find out the effectiveness of the product, field tests are conducted online through developed applications. Research data in the form of teacher performance in learning planning, carrying out learning (online and offline), conducting learning evaluations, mentoring student activities, making scientific works, preparing class action research (PTK), activeness in professional associations (KKG and MGMP), and making learning innovation work. All aspects of this assessment are controlled using an app within the Android platform owned by each teacher as a research subject.

Results and Discussions

In the early stages of research has been conducted needs analysis. The needs of users are: teachers (both at elementary, junior high/ MTs, and high school / K) are focused on which components are part of the development of professional skills that they need. The results of this need analysis are then translated into the application into classes offered to equip the desired skills of the user. These classes are scientific article classes, innovative article classes, textbook classes, module classes, diktat classes, theory classes, and inobel classes.

Theory class is given as learning material for all users because it is presented theories, guidebooks that add to the understanding of the user (teacher) in the following activities per class. The display of the menu of the classes is as follows.

Figure 2. Classes provided in the application

The ease of communication between users and the presence of participants who choose the same class is facilitated through the message menu. Participants can update their profiles, making it easier to discuss further when they find topics that are considered very interesting to be discussion material.

The following features are very helpful for participants to stay connected with the discussion topics raised by the participants. Participants can easily join the desired class by simply clicking the 'join' menu.

Figure 3. Discussion menu as a link between app users

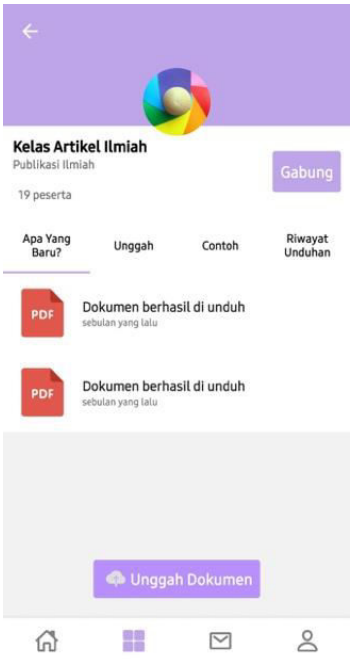

Figure 4. The menu shows in one of the classes provide 'join' facilities

Users easily use the application that has been developed because to register only register a google or Facebook account.

Figure 5. Registration menu using Google or Facebook account

The algorithm used for the entry process can be seen in the following diagram.

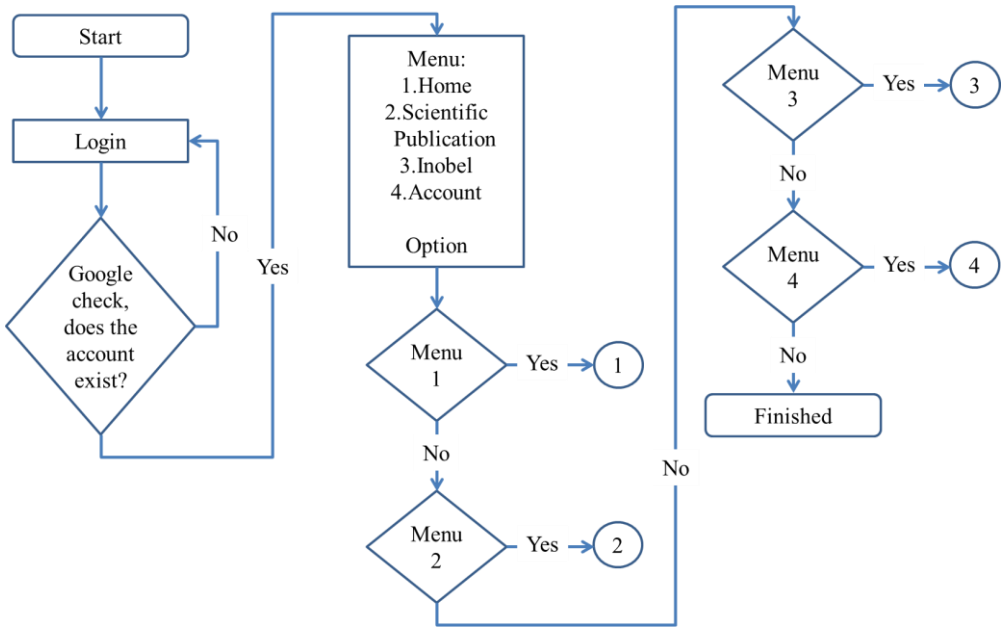

Figure 6. Flow chart of user entry system and assistance menu serving offered

The mechanism of application usage can be explained through the diagram as follows.

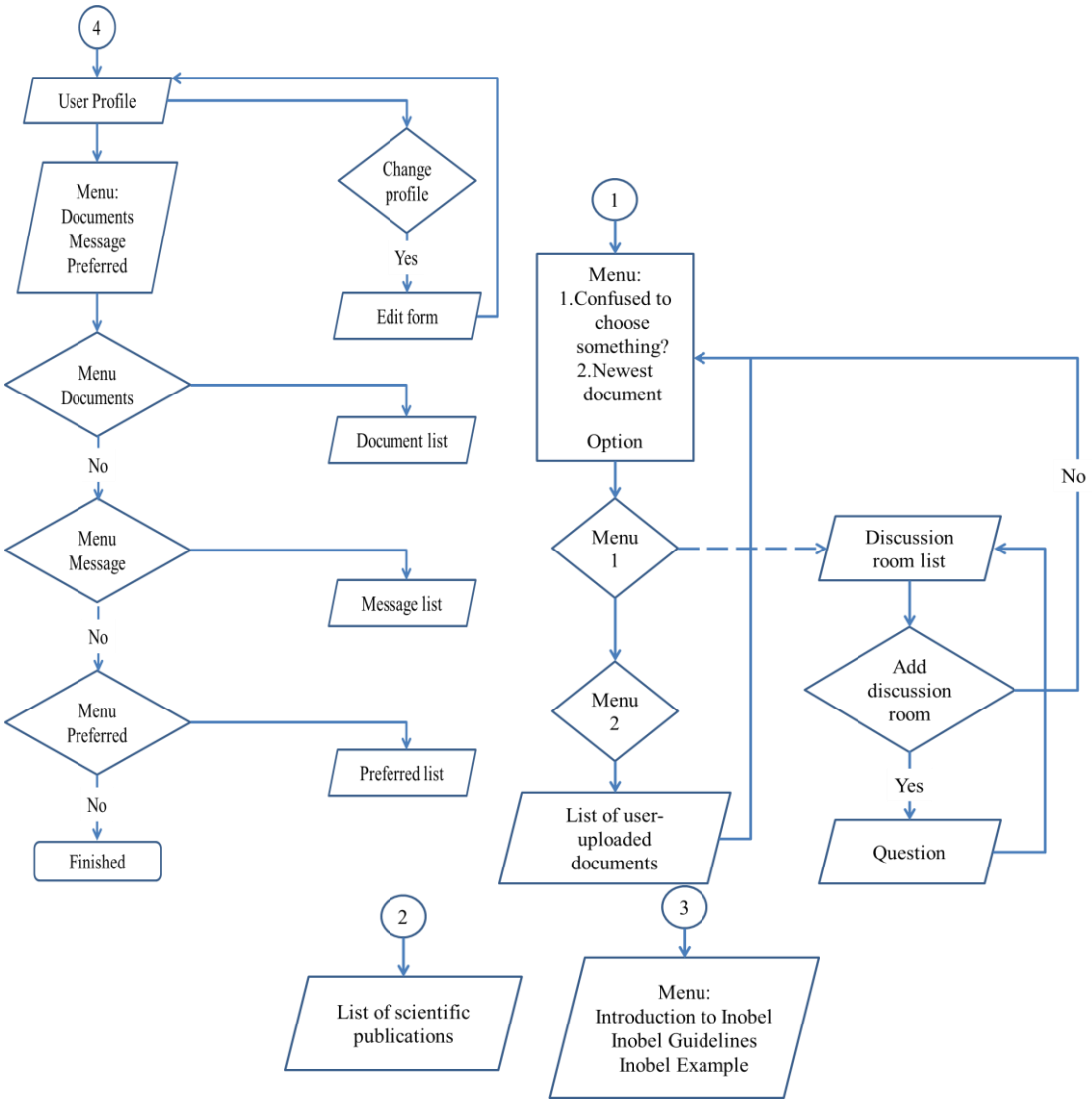

Figure 7. Flow chart of application usage mechanism for document repair

Document tracking and coding types of services are facilitated by AI (artificial intelligence) so that users get responses quickly to be served according to what skills are needed. Teachers can choose to assist in the creation of learning innovations (inobel), the extension of scientific works, and PTK reports. The three types of services are used as indicators of the measurement of the performance of PKB teachers.

The application of a teacher performance assessment system to support teacher professionalism has been tested on 35 teachers in the Sleman Yogyakarta district. The teachers involved are scattered starting from elementary school teachers, subject teachers in junior high and high school. The distribution of each class enthusiast offered can be presented in the following diagram.

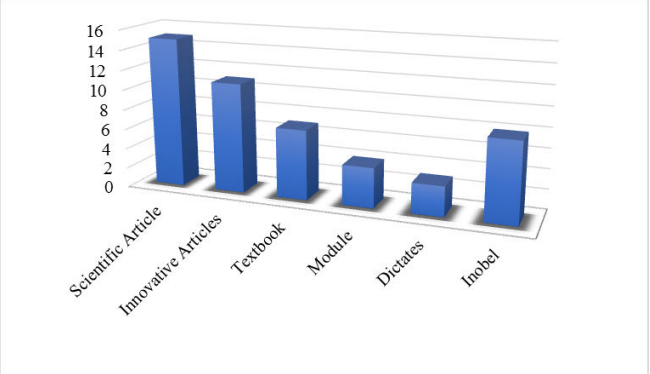

Figure 8. The spread of the number of participants in each class offered by the application

Participants in the class of scientific articles and innovative articles ranked first and second. This indicates that teachers need further assistance in

the skills of composing scientific articles and innovative articles. These two articles have different purposes. Scientific articles emphasize more on the results of research that has been done by teachers including the results of the implementation of Class Action Research (PTK). Innovative articles are a companion of learning innovation products (Inobel) which is annually organized by the Director-General of Teachers and Education (Director General of GTK). Inobel in the form of the development of innovative works that utilize technology as a support for learning. This is following the statement of Jan (2011) that the development of professional teachers should incorporate the use of technology integration in teaching.

The results of the analysis of mentoring in the scientific article preparation class are divided into several problems that are often found by participants, namely: problem identification (IM), literature studies (KP), research methods (MP), research design (DP) and data interpretation (ID). Sub-sub problems in composing scientific articles are felt by participants as one of the reasons why it has been difficult to develop work in the form of scientific articles. Based on 15 participants in the scientific article class can be known that the spread of problems is still found by participants. It is presented in the diagram below.

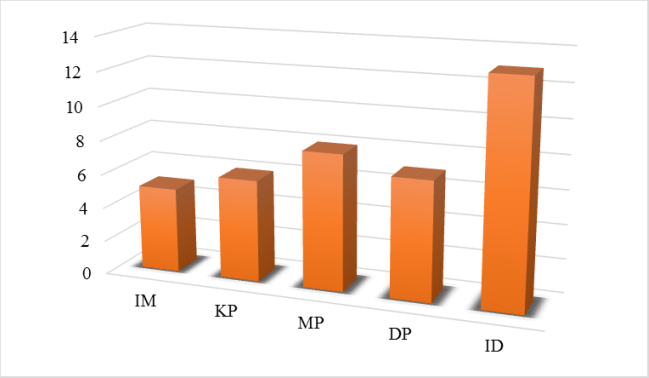

Figure 9. Dissemination of identification of participants' difficulties in the preparation of scientific articles

The components of data interpretation and research methods became the findings of the most difficulty in the scientific article class. Participants more often present research data or findings in the form of tables, charts, or graphs. However, the data has not been interpreted its purpose and meaning. This has an impact on scientific articles that are presented to be less informative and often experience rejection when sent to research journals or other scientific publications.

The progress of teacher professional mentoring in various classes can be monitored by the supervisor or principal if they join the classes. This is because qualitative progress reports can be seen based on the assessment by the instigator in the form of an asterisk ranging from one star to 5 stars which is a marker of the progress of each program. This supports the teacher performance assessment system that can be done by the principal or supervisor to measure the competence of teachers (Fien, 2010).

Conclusion

Sustainable professional programs conducted by teachers require a gradual process and the support of various parties. Mentoring by principals and supervisors is very helpful to direct teacher professionalism in both learning planning, classroom management, and managerial aspects of schooling and other non-teaching practices. The product development that has been tested shows its effectiveness in assisting teachers to identify their strengths and weaknesses in improving their professionalism. The achievement of the target of each program's progress in the classes offered indicates an effective improvement in teacher performance to conduct class action research and compile scientific articles as part of a sustainable professional program.

References

[1] Badley, G. 2006. The Teacher as Change Agent. Journal of In-service Education. Vol. 12:3 p. 151-158. Doi: 10.1080/0305763860120305

[2] Barnes et al. 2017. Preface for the special issue on AI-supported education in computer science. International Journal of Artificial Intelligence in Education, 27(1), 1-4

[3] Benhard Farraz. 2019. Mengenal Artificial Intelligence dan Kegunaannya. http:

www.cnbcindonesia.com (diakses tanggal 15 Desember 2019)

[4] Bing, L., & Zhiling, Y. 1991. Teacher Education Innovations In The Asia Pacific Region. Action In Teacher Education Fall 1991 Vol XIII No. 3

[5] Blomeke, S., Suhl, U., & Dohrman, M. 2013. Assessing strength and weaknesses of teacher knowledge in Asia, Eastern Europe, Western Countries, Differential Item Functioning in TEDs-M. International Journal of Science and Mathematics Education (2013). Vol. 11 p. 795-817

[6] Cher Ping Lim. 2013. Strengthening the Research Practice nexus: A special Issue as a Springboard for Building The Capacity of Teacher Education Institution in Asia. Internet and Higher Education 16 (2013) p. 32-35

[7] Dick, W., Carey, W., & Carey, L.O. 2015. The Systematic Design of Instruction 8th Edition. Pearson: USA

[8] Dini K., Utami W., & Bambang Y. 2017. How do Indonesian Professional English Teachers Develop Their Pedagogical Competence in Teaching Implementation?. Arab World English Journal (AWEJ) Volume 8 Number 2 June 2017 Pp. 293-307 DOI: https://dx.doi.org/10.24093/awej/vol8no2.21

[9] Dobinson, T. 2014. Out of Asia: Learning re-Examined, Teacher Education re-configured. Asia Pacific Journal of Education Vol 32. No. 2 June 2012 p. 167-179

[10] Fien. 2010. Sustaining Action Research and Professional Development in Teacher Education For Sustainability: A Case Study From Asia and The Pacific. International Research on Geographical and Environmental Education. 7: 3 p. 251-254

[11] Hakim, L. & Dalli, C. 2016. "To be professional is a never-ending journey": Indonesian Early Childhood Practitioners Views about the Attitude and behaviors of a Professional Teacher. Early Years An International Research Journal ISSN: 0957-5146

[12] Jan, H. 2017. Teacher of 21st Century: Characteristics and Development. Journal of Research on Humanities and Social Sciences Vol. 7 No. 9, 2017

[13] Karsenti. 2019. Artificial Intelligence in Education: The Urgent Need to Prepare Teachers for Tomorrow's Schools. Journal of Formation et profession, 27(1), 112-116.

[14] Mohammed. 2019. Towards Inclusive Education in the Age of Artificial Intelligence: Perspectives, Challenges, and Opportunities. Journal of Artificial Intelligence and Inclusive Education(pp. 17-37). Springer, Singapore

[15] Nicols & Holmes. 2018. Don't Do Evil: Implementing Artificial Intelligence In Universities. Towards Personalized Guidance and Support for Learning, 109.

[16] Popenici, SA., & Kerr, S. 2017. Exploring The Impact of Artificial Intelligence on Teaching and Learning in Higher education. Journal Research and Practice in Technology Enhanced Learning (2017) 12:22 DOI 10.1186/s41039-017-0062-8

[17] Timms. 2016. Letting artificial intelligence in education out of the box: educational robots and smart classrooms. International Journal of Artificial Intelligence in Education, 26(2), 701-712.

[18] Walkington & Bernacki. 2019. Personalizing Algebra to Students' Interests in an Intelligent Tutoring System: Moderators of Impact. International Journal of Artificial Intelligence in Education, 29(1), 58-88