Continuous Learning Process Design in Increasing Science Teachers Competence at Secondary School

Article *in* Jurnal Pengajaran Matematika dan Ilmu Pengetahuan Alam · October 2020

DOI: 10.18269/jpmipa.v25i2.24043

1 author:

Muhammad Djajadi
Universitas Muhammadiyah Makassar
16 PUBLICATIONS **30** CITATIONS

Jurnal Pengajaran MIPA
Vol. 25, No. 2, Oktober 2020, 81-91.
ISSN 1412-0917 (print)/ 2443-3616 (online)

DOI: 10.18269/jpmipa.v25i2.24043

CONTINUOUS LEARNING PROCESS DESIGN IN INCREASING SCIENCE TEACHERS COMPETENCE AT SECONDARY SCHOOL

[12]Muhammad Djajadi

[1]Physics Education, FKIP-Muhammadiyah University of Makassar-Indonesia
[2]Human Resources Development Agency of South Sulawesi-Indonesia
E-mail: m.djajadi@unismuh.ac.id

ABSTRACT

This study examines the phenomenon of continuous teacher professional development (CTPD) activities in improving the competence of science teachers. This case study research investigates forty secondary school science teachers in Makassar Indonesia using various methods. Thirty-six science teachers completed the questionnaire, nine conducted interviews, and four were observed in classroom teaching. The findings indicate that CTPD activities can enhance the competency of secondary school science teachers in Makassar, Indonesia. This research has identified four learning activities that are often carried out by science teachers in Makassar-Indonesia, namely; self-directed learning, sharing opinions, inquiry activities, and education and training activities. The research also found six obstacles reported by science teachers in the CTPD activities, either in the process of implementing activities or in applying competency acquisition. The results of this study offer - a framework for CTPD activities in improving the competency of Science teachers in Makassar, Indonesia. Therefore, this research is expected to contribute ideas and thoughts to various parties to provide support to science teachers in identifying the needs of CTPD activities to continuously improve their competencies, for more effective learning.

Keywords: Continuous Teachers' Professional Development; Science Teachers' Competency.

How to cite: Djajadi, M. (2020). Continuous learning process design in increasing science teachers' competence at secondary school. *Jurnal Pengajaran MIPA, 25*(2), 81-91.

INTRODUCTION

Continuous Teacher Professional Development (CTPD) activities for teachers is a very important effort to improve teachers' competence. Learning among the teachers is an attempt for their career development and social mobility, while the government's perspective about self-learning of teachers is one of the important steps towards the country's goal of educational development. Some studies show that the process of continuous learning is one of the main mechanisms in improving teacher learning competencies in the classroom and improving student learning outcomes (Cohen & Hill, 2000; Darling-Hammond at al., 2019; Little, 2003). On the other hand, there are shortcomings in the implementation of quality CTPD activities, such as the types of learning activities, active learning, limited time, collective participation, giving focus to improving competence, teacher feedback, and the impact on student learning (Darling-Hammond et al., 2017; Garet et al., 2001; Guskey, 2000; Loucks-Horsley et al., 2010).

The Indonesian government has a long story of implementing a variety of continuous learning programs for teachers who are expected to have a significant impression on improving their teaching competencies. Although the actual effectiveness of various programs is still at issue, with the assumption that more and more programs are implemented, it turns out that teacher competence is not getting better (Adey, 2004; Nielsen, 1998; Rosser, 2018; van den Berg, 1992). Other huge educational issues to highlight were low-quality teaching and the decline in student graduation. The implementation of CTPD activities was assumed to be less attractive, ineffective, and did not have a crucial impact on improving the quality of teaching and learning in the classroom (Barrett et al., 2015; Depdiknas, 2006; Tanang et al., 2014; Thair & Treagust, 2003).

Received: 14 April 2020
Accepted for publication: 19 December 2020
Final version: 20 December 2020

Similarly, the results of the Teacher Competency Test (UKG) conducted by the government show that many teachers have not reached the expected standard of competence and do not dominate the information and communication technology (Mahsunah et al., 2012). About 12,683 teachers in Makassar who participated in the UKG gained an average score of 55. Also, the school supervisors report that the value of UKG was still below the standard. (Fadli, 2015). Therefore, it rings the bell for the need for an effort to improve teacher competence, especially pedagogical, social, and professional competencies.

Currently, various activities have been carried out by the Indonesian government in providing a solution to the problem. One of them is by implementing teacher in-service activities at the district/city and school level. The analysis shows that the implementation of the teacher in-service program not only potential to increases knowledge and professionalism but also becomes a tool to improve the social status of the teachers (Fakrurridha & Nurdin, 2020). However, the results of the study indicate that improving teacher quality does not significantly affect student graduation rates (Nielsen, 1998; Thair & Treagust, 2003). Many educational experts and observers argued the quality improvement of teachers in Indonesia because the implementation of various activities in the CTPD activities is considered ineffective (Thair & Treagust, 2003; Nielsen, 1998; Rosser, 2018).

Some government efforts to improve the CTPD activities in Indonesia, covering (1) implementation of various training activities for core teachers and instructors, (2) learning facilities, and (3) improving the quality of learning activities management, and block-grant to assist teachers in implementing various programs and activities. All efforts, program implementation, and support from the government are expected to provide strength in improving the performance, achievements, and competencies of teachers in Indonesia. However, it was found that (1) the motivation of science teachers in compiling the Lesson Plan that fit the 2013 curriculum is still low. This covers the lack of interest in using the suggested teaching strategies or models like discovery learning, inquiry learning, problem-based learning, project-based learning through the scientific approach; (2) many teachers were not able to compile classroom action research (CAR) which was part of their career and research development efforts; and (3) many teachers were not capable to use computer & internet, either to facilitate teaching or to enrich learning resources. As a result, many teachers are unable to complete the tasks given (MGMP-IPA, 2018).

Based on the explanation of the various conditions above, the authors argue that finding more effective and meaningful CTPD activities as the crucial gap to address by science teachers in Makassar. The authors consider that it is very significant to understand the nature and characterristics of CTPD activities that are believed to be able to assist teachers in improving their competence. In other words, the authors assume that research on CTPD activities should take into account the learning perspective holistically because it can help? to understand the phenomenon of teacher learning which in turn could assist them to improve their competence. The formulation of the problem in this study is what types of activities being pursued by secondary school science teachers in Makassar as part of their teacher professional development? What are the obstacles found by science teachers in their CTPD activities?

METHODOLOGY

This study uses descriptive qualitative which uses a case study approach. The populations of this study were all secondary science teachers in Makassar, Indonesia. The data collection instruments used open-ended questionnaires, observation, interviews, and documentation. Through the use of purposive-non probability sampling techniques, the authors employed thirty-six science teachers to answer open-ended questionnaires, nine science teachers are interviewed, and four science teachers are observed in the classroom while teaching. Data obtained through open-ended questionnaires, interviews, observations, and documents were analyzed using thematic analysis using NVivo software. The authors followed Denzin and Lincoln (2009) suggestion to analyze data with the following procedures. First, record coded data so that the sources can still be explored. Secondly, collect, sort, classify, synthesize, make summaries, and index. Miles and Huberman (1994) reveal that data analysis is a process of establishing and systematically searching transcripts, observations or field notes, and other information through documents that have been collected by researchers. While data analysis activities are conducted by analyzing, sorting, dividing up into units that can be synthesized

with fat and systematically reported. To ensure the confidentiality of respondents' identities, researchers used coding such as GS/Q-01 for questionnaire respondents and GS/I-01 for interview respondents. "GS" is the science teacher code, "Q" is the questionnaire code, and "I" is the interview code. Whereas 01 refers to respondents.

RESULTS AND DISCUSSION

The question to be answered is what the CTPD activities are being pursued by secondary school science teachers in Makassar? To answer the question of this study, this section will discuss the analysis of the open-ended questionnaire, interviews, observations, and document analysis on the activities being undertaken in CTPD activities

Table 1 shows the total distribution of respondents according to the level of CTPD activities. The findings showed that the science teacher agreed that the professional development program should be done continuously. A total of fourteen (38.9%) respondents labeled the implementation of continuous professional development programs at a very strong level. A total of nineteen (52.8 %) stated that the implementation of the professional development program continued to be at the agreed level. One person (2.8%) stated that the implementation of professional development programs continued to be at the usual level and there were two (5.5%)

Table 1. Teacher Learning Process

Description	Amount	Percentage
The teacher learning process should be done continuously		
- Strongly agree	14	38.9
- Agree	19	52.8
- Ordinary	1	2.8
- Disagree	2	5.5
- Strongly disagree	-	-

respondents disagreed with the implementation of professional development programs.

Furthermore, Table 2 shows the distribution of the number of respondents according to the continuous learning activity based on the perception by the science teacher. The result of the analysis shows that the learning activity that is favored by the science teacher is self-directed. About fifteen people (41.7%) respondents' perceived learn self-direction the most effective followed by selected education and training activities which received (25.0%) voted. In the third place, share opinions activities are chosen by seven (19.4%) respondents. And inquiry activities regarded the least favored with a total vote of five (13.9%) respondents. According to respondents, self-directed learning activities can be carried out by reading news-papers or magazines, reading other references, and through the internet. Sharing opinions can be done by exchanging thoughts with colleagues and asking colleagues who have more knowledge through mentoring. Furthermore, according to the respondents, inquiry activity was conducted by conducting action research and designing the Student Worksheet. According to respondents, types of activities that are considered to be the most popular activities of the respondents through Teachers Networking activities, workshops, or seminars.

Table 2. Learning Activities Preferred by Science Teachers

Description	Amount	Percentage
Learning activities favored by science teachers		
- Self-directed learning activities	15	41.7
- Education and training activities	9	25.0
- Sharing opinions activities	7	19.4
- Inquiry activities	5	13.9

Overall, based on the results of data analysis using thematic analysis techniques. This research has identified four learning activities that are often carried out by science teachers in Makassar-Indonesia, namely; independent learning (through reading book learning (through reading books, newspapers, or magazines and reading articles on the internet), sharing opinions (through mentoring

and lesson study), inquiry activities (through classroom action research), and education and training activities (In-service and Teacher Networking).

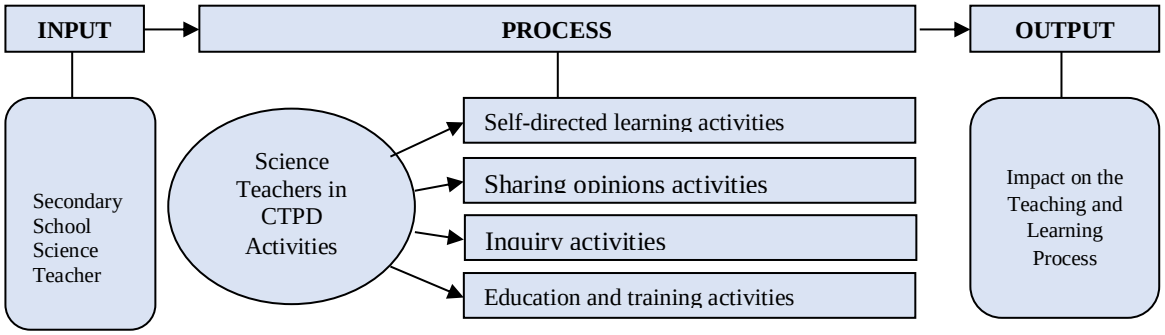

Figure 1. CTPD activities based on factors originating from the science teacher itself

Regarding barriers that teachers reported while joining in CTPD program include obstacles in the implementation of the CTPD activities and obstacles in applying competency acquisition in schools. Based on the research findings, the authors identified six obstacles in the CTPD activities in improving the competence of science teachers in Makassar. These obstacles have the potential to become a major problem that can affect the success of CTPD activities in improving teacher competency as a whole. The authors' signify that the main problem of continuing teacher learning can be seen from the individual teacher itself. These findings are also consistent with the results of research conducted by Djajadi (2015), Faisal and Martin (2019), Rahman (2016), Sari and Lim (2012), Sumintono et al. (2012), Thair and Treagust (1999, 2003), Van den Berg (1992), and Widodo and Riandi (2013) that to improve the quality of science education in Indonesia, especially in Makassar, it needs to be focused on several things, namely: 1) improvement educational attainment and accessibility of resources, 2) striving to improve student achievement, 3) constantly strengthening teacher preparation and professional development, and 4) activating research in the field of science education and collaboration efforts.

The second problem to address is what obstacles do science teachers have in the CTPD activities in improving their competencies? To answer this question, the researchers analyzed data from open-ended questionnaires and interviews, also data from observations, and documents. This analysis aims to identify obstacles faced by science teachers in implementing CTPD activities in improving their competencies.

The analysis found that there are various obstacles faced by the respondents in conducting self-study activities. One of them is the use of time. Respondent GS/Q-09 acknowledged her experience of being rarely conducting self-study activities as more time was spent at home. This statement is also supported by respondents GS/Q-28 and GS/Q-30, who reported to rarely conduct self-study activities because of the limited time she has because there are many other activities to be completed either at school or at home. Respondents GS/Q-31 and GS/Q-13 explained that from 7.00 am to 5.30 pm, they were at school because of the high number of school assignments, so it's impossible to learn and repeat and enrich the CTPD materials more than three times a week. For GS/Q-35, there was a shortage of physics teachers in their schools, making teaching and learning activities more than three times a day. As a result, the implementation of self-learning activities is limited. In other words, the obstruction of physics teachers in self-directed learning stems from the use of time in the learning process.

Based on the open-ended questionnaire analysis, the researchers also found some obstacles in responding to Class action research (CAR) activities. Respondent GS/Q-28 t, for example, revealed many of the obstacles he faced as he first started doing CAR. This view is strongly supported by GS/Q-22. He argues that barriers to conducting action study learning activities,

> *Except for the first time I did, there was a shortage of books referenced in supporting reports and the lack of peer mentors who understand and could assist us in doing action research activitie*

Respondents GS/Q-08, GS/Q-12, and GS/Q-22 also agree with GS/Q-28 and GS/Q-22 respondents' views above. They said knowledge and skills in organizing CAR activities were minimal, lack of references supporting the study, and many teachers did not understand action research. The GS/Q-09 respondents revealed the real problem in carrying out the report preparation activities, especially in the sketching verse after verse. Meanwhile, respondents GS/Q-17 and GS/Q-04 said the CAR activities were very interesting, mainly related to teaching and learning and assessment, but were hindered by the time to find reference sources. Therefore, perseverance is required, so as not to be hampered by the busyness (GS/Q-12).

Finally, as a result of the importance of implementing CAR activities for teachers, Indonesian education policymakers and professionals have included it as teaching materials in the Teachers Networking (MGMP) Quality Training program. This is because CAR activities can be conducted either privately or in groups. According to a report on the MGMP Remote training activities in 2018 (analysis of research documents) in 20 MGMP Science members, only eight teachers (40 percent) completed the CAR proposal draft and only five of them (25 percent) that have settled down to the level of the research report. This indicates that only about 25 to 40 percent of science teachers are actively engaged in CAR activities.

The analysis further found barriers to the implementation of lesson study activities caused by other activities to carry out. Two respondents, GS/Q-13 and GS/Q-18 acknowledged that they rarely engaged in lesson study activities due to their hectic activities. Respondent GS/Q-13 closely recognizes,

> *... because of the busyness of each teacher in the classroom densely packed with a 24 hour/ week teaching load supervision of co-workers, the lesson study activities decrease. We could only do it during break hours.*

The situation of GS/Q-13 and GS/Q-18 respondents indicates that the lesson study activities are quite difficult to apply. Also, respondents GS/Q-02, GS/Q-15, and GS/Q-24 stated that barriers to other lesson study activities were the lack of

The implementation of the lesson study is hindered by time from limited colleagues, making it difficult to be more intensive and successful. The GS/Q-02 respondents acknowledged that they sometimes conducted peer evaluations on specific lesson study activities. Similarly, GS/Q-15 respondents declare the implementation of time-limited lesson study activities. Therefore, the comments of the respondents indicate that the barriers to the implementation of the lesson study activities are limited due to the variety of other activities.

Based on document analysis, the researchers found various obstacles in implementing training program learning activities. Data from the 2018 MGMP Quality Zone 4 remote (research documentary) activity report shows that teachers were tended to have low motivation in preparing plans syllabus (RPS), lesson plans (RPP), and PAIKEM teaching approaches. Also, data from the same document also imply several obstacles in conducting training program learning activities, including, (1) difficulty in empowering the secretary of the MGMP to maximize participants' attendance in joining the training program, (2) the fund given for the operational cost of MGMP is so limited, (3) some teachers are unable to use a computer that resulted in the incomplete task, (4) there is no synergy between the activities of the MGMP and the teaching schedule.

Questionnaire analysis revealed some of the obstacles that respondents face in training program learning activities. Respondent GS/Q-12, for example, explained that the MGMP only invite two teachers from each school to participate in the training. This contradicts the real condition where there are many physics teachers available at school. He said,

> *The invitation to attend the training is only addressed to limited participants, usually for two teachers. ...in fact there are some physics teachers at school and I am the youngest so the opportunity is usually given to our seniors.*

A similar response also argues by GS/Q-22 who is rarely included in the training program. GS/Q-22 added;

> *The limited number of participants to join the MGMP just stole our opportunity to learn.*

Both GS/Q-12 and GS/Q-22 did not attend the training program as the number of participants was limited and they were still considered as novice teachers whereas the majority of those sent to MGMP were experienced teachers. The interesting opinion was stated by respondents GS/Q-17, GS/Q-10, and GS/Q-31. These respondents argue that the recruitment system of who is eligible and not eligible to join the program should be revisited.

Other views on barriers to learning activities of training programs are stated by GS/Q-33 and GS/Q-24. According to GS/Q-33;

> *Learning activities of regular training programs are not well managed. ...there are too many tasks to accomplish and we only have very limited time so the results are not satisfactory.*

Therefore, GS/Q-24, suggest to employ be a specialist, a kind of a well-trained Trainer or a qualified teacher. Test GS/Q-24,

> *Learning activities of MGMP training programs would be better if it is delivered by a qualified trainer/teacher educator.*

GS/Q-32 agreed to his fellow. He said the implementation of the learning activities of the training program had been conducted during the school hours until the teachers were exhausted. This condition results in less achievement. It is also worsened with the increased number of students in one class and the limitation of school facilities to support the implementation of the new methods derived from the training program.

Data from observation reveal that MGMP Quality Zone 4 remote session 4 training program it was found that there was less teacher involvement, bureaucratic activity patterns from the top down, and one-way learning activities that did not show initiative from the teacher himself. The same applies to observations made by resear-chers in the Makassar MGMP combined teacher training program learning activities, SMPN 34 Makassar workshops 1 to 3 sessions, observations at the SMPN 34 Makassar teacher workshop, and observations at the MGMP Makassar 3 of science teacher workshop session 1 to session 3.

Based on the analysis of questionnaire data, interviews, observations, documents, and based on the respondents' statements, the researchers summarized nine obstacles encountered by the respondents in the implementation of training program activities. This covers (1) The inefficacy of time due to the implementation of activities during school hours (2) Less transparency in the recruitment of the trainee teacher or the Teacher Educator to employ in the program. (3) The large class size that makes the application of the new knowledge more difficult. (4) Teachers' low motivation in designing new RPS, RPP, that PAIKEM-based teaching activities. (5) The low percentage of teachers' attendance that is caused by disc synergy between the time of the implementation of the program activities and the teaching and learning schedule at school. (6) The limited amount of operational costs given to MGMP (7) Teachers' inability to use a computer, (8) Unfair recruitment of participants to join the MGMP program that only involves only experienced teachers. (9) The top-down bureaucratic activity pattern (10) the monotonous learning methods used in the program the activities in the MGMP program are similar to bureaucratic meetings that took place in the past. The majority of passive teachers listening to lectures from five presenters (namely, principals, two school supervisor, instructor, and teacher educators) caused teacher creativity to be underestimated. The time spent in the presentation of the learning program was only 45 minutes, while the lectures were from five presenters takes four hours. This proves that the teacher's learning process in the training program is focused on ceremonial matters only not on the actual pattern of improvement of competence. Overall it can be seen in Figure 2 below.

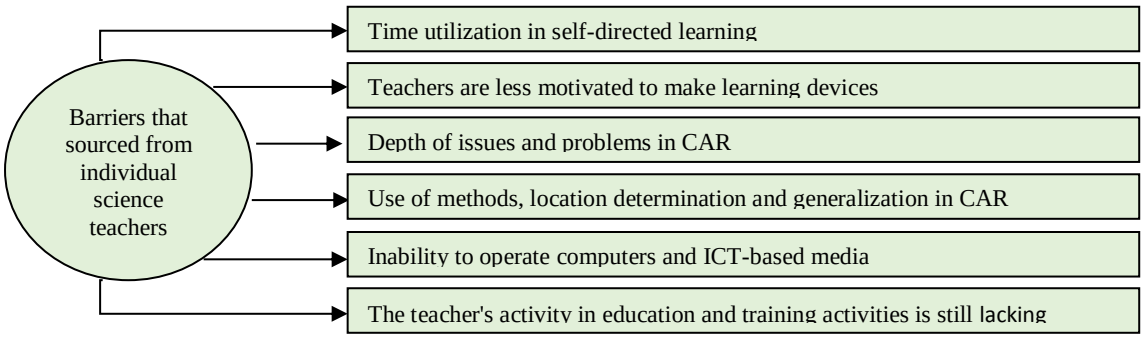

Figure 2. Barriers that sourced from the science teacher itself

1. Time utilization in self-directed learning

Regarding time efficacy in self-directed learning, Blackburn (2000) & Hasanah (2012) suggest to carry out the activity both at home and at work. Also, science teachers should be aware that self-directed learning can provide an impetus to increase the effectiveness of learning, namely learning activities can become more meaningful because the teacher is protected from feeling depressed, indecisive, and unmotivated (Emda, 2018; Lestari, 2015). Teachers who have been able to do self-regulated learning will be reflected in their ability to actively participate in the learning process both in terms of metacognitive, motivational, and behavioral characteristics in achieving learning goals (Montalvo & Torres, 2004). The characteristics of self-directed learners are (1) initiative or internal drive, (2) setting goals, (3) actively and creatively looking for learning resources, and (4) being aware of who they are. Self-directed learning in its implementation requires an understanding of several concepts so that independent learning activities can run well. The effectiveness of the implementation of the concept of independent learning can be improved by understanding the concepts of motivation, goal orientation, self-efficacy, locus of control, metacognition, and self-regulation.

2. Teachers are less motivated to make learning devices

Science teachers are always active in the preparation of learning devices (RPS and RPP) using the 2013 curriculum by integrating Character Education Strengthening (PPK) as the implementation of Presidential Regulation Number 87 of 2017. Character Education Strengthening (KDP) encourages teachers to be able to design, implement, and assess learning to strengthen students' character by putting forward the five main values of character, namely religiosity, nationalism, independence, cooperation, and integrity. Students need to be provided early with what is called 21st Century skills, especially 4C skills namely critical thinking and problem solving, collaboration, creativities, and communication (Siswanto et al., 2018). Also, science teachers must be able to carry out competency, learning, and assessment analysis, namely (1) analysis of SKL, KI-KD, syllabus, and subject matter guidelines, (2) analysis of material in textbooks, (3) analysis of model application learning, and (4) analysis of learning outcomes assessment. In implementing classroom learning, science teachers must be able to use learning models such as Discovery Learning, Inquiry Learning, Problem Based Learning, and Project-Based Learning and Scientific learning approaches. Also, science teachers along with other teacher colleagues need to improve various ways to overcome problems in the teaching and learning process (Depdiknas, 2010, Renstra Depdiknas, 2010).

3. Depth of issues and problems in CAR

More effective and in-depth searches are needed, especially from one topic of teaching material, the quality of the reference sources used, and the depth of the analysis. Teachers should have the opportunity to apply what they have learned in class based on the content and needs of students (Darling-Hammond et al., 2020). Science teachers must be able to identify problems, analyze problems, determine topics, and formulate problems. Based on the formulation of the problem, so the science teacher can formulate an action hypothesis. To be able to feel and express problems, science teachers are required to be honest with themselves and see the learning they manage as an important part of their world.

4. Use of methods, location determination, and generalization in CAR

We need to adjust the situation and conditions and location of the study so that a method can be used. This is because CAR findings should not be generalized. The teacher has the opportunity to use new things and new methods they have taught (Faisal & Martin, 2019; Rahman, 2016). The use of learning models wherever possible is adapted to the characteristics of problems that occur in the classroom, the teacher needs to make an action plan or often called an improvement plan. In compiling and formulating an improvement plan that will be formed in an action hypothesis. The action hypothesis is the teacher's guess about the best way to overcome the problem. These allegations or hypotheses are made based on the study of various theories, studies of the results of research that have been carried out in similar problems, discussions with colleagues or experts, and reflections on their own experiences as teachers. Based on the results of the study, the teacher prepares various alternative actions. Furthermore, the teacher needs to examine each alternative, especially the relation to the objectives of the action (improvement) and the feasibility of its implementation. Finally, by considering the results of the study, the teacher chooses the alternative that is considered the most feasible.

5. Inability to operate computers and ICT-based media

The phenomenon of the use of ICT in school learning is increasingly resonating. Even in the 2013 curriculum, ICT plays a very important role in the implementation of learning. In the 2013 curriculum, the use of ICT is needed in the context of the effectiveness and efficiency of learning. That is, the present situation, material, tasks, and others can be transferred through ICT. Science teachers must always be active in attending seminars/courses/ workshops, especially in ICT operations and the use of ICT-based learning media. Therefore, teachers of the 21st century need to continue to study the latest technologies that can have implications for improving student learning outcomes and meeting goals in increasing their professionalism (Sumintono et al., 2012). The benefits of using ICT to support the implementation of learning are (1) improving the quality of learning, (2) expanding access to education and learning, (3) helping to visualize abstract ideas, (4) facilitating understanding of the material being studied, (5) displaying learning material becomes more interesting, and (6) allows interaction between learning and the material being studied.

6. Teachers' lack of educational and training activities

Education and training is a coaching program for teachers to improve their skills and knowledge in carrying out their profession so that professionalism and work performance increase. In education and training, an environment is created where employees can obtain or learn specific attitudes, abilities, skills, knowledge, and behaviors related to their work. A planned and continuous training program must also be able to encourage teachers to improve and maintain their professionalism, and in the end, it will have an impact on teacher performance, especially in terms of improving the quality of services to students (Djajadi et al., 2012; Gunawan, 2015; Emda, 2016; Kurniawan, 2018). The principal should provide encouragement, assistance, and physical facilities to the teacher to always be active in education and training activities. Also, the State, through the Provincial and District/City Education Offices, the Education Quality Assurance Agency (LPMP) or the Directorate General of Teachers and Education Personnel, needs to provide reasonable awards and incentives to MGMP member teachers (Thair & Treagust, 1999, 2003; Nielsen, 1998; van den Berg, 1992).

Finally, based on the six barriers in the activities of the CTPD activities that come from personal science teachers, so that it has the potential to become a pressure issue that occurs among science teachers. This obstacle makes the CTPD activities in improving science teacher competence difficult to reach the output phase. Therefore, all parties involved need to pay attention and implement an approach to solving these obstacles. Teachers need to be rational, the school needs to think about the resolution of the appropriate environment and the country also needs to consider more intensively along with its virtues. This is so that the operational education can run smoothly in line with the actual mission and vision.

CONCLUSION

The implementation of CTPD activities for science teachers provides an overview of their efforts to improve their competencies, such as the implementation of CTPD activities at 40 secondary schools in Makassar Indonesia. Four continuous learning activities are passed by the respondents, namely independent learning activities, activities for sharing opinions, inquiry activities, and education and training activities. The teachers have provided feedback in the form of achieving knowledge and skills to carry out the activities of effective teaching and learning in the classroom. The government, learning organizations in schools, the private sector, and parents of students have fully supported the teacher's CTPD activities. Furthermore, there has been obtained a framework for CTPD activities in improving the competence of science teachers in Makassar. This framework describes a continuous effort that must be carried out by science teachers in their learning process to achieve certain goals. This process framework consists of three main phases namely the input phase, the process phase, and the output phase. The input phase is the science teacher at Makassar, the process phase includes continuous learning activities, and the output phase is the impact of the CTPD activities on the learning process and student learning outcomes. The learning process of science teachers succeeded in achieving output if obstacles can be overcome. This means that the success of the CTPD activities of science teachers in Makassar depends on the ability of teachers to handle obstacles in the learning process. The effectiveness of teaching science teachers in Makassar is very dependent on the success of the CTPD activities that they conducted.

REFERENCES

Adey, P. (2004). *The professional development of teachers: Practice and theory*. Springer Science & Business Media.

Barrett, P., Davies, F., Zhang, Y., & Barrett, L. (2015). The impact of classroom design on pupils' learning: Final results of the holistic, multi-level analysis. *Building and Environment, 89*, 118-133. DOI: https://doi.org/10.1016/j.buildenv.2015.02.013

Blackburn, B. R. (2000). *Barriers and facilitators to effective staff development: Perceptions from award-winning practitioners* (Doctoral dissertation, the University of North Carolina at Greensboro).

Cohen, D.K., and Hill, H.C. (2000). Instructional policy and classroom performance: The mathematics reform in California. *The Teachers College Record, Vol. 102* (Iss. 2), pp. 294-343. http://www-personal.umich.edu/~dkcohen/cohen_hill_2000_TCR.pdf

Darling-Hammond, L., Hyler, M. E., Gardner, M. (2017). *Effective Teacher Professional Development*. Palo Alto, CA: Learning Policy Institute. https://learningpolicyinstitute.org/product/teacher-prof-dev.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for the educational practice of the science of learning and development. *Applied Developmental Science*, 1-44. DOI: https://doi.org/10.1080/10888691.2018.1537791

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for the educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97-140. https://doi.org/10.1080/10888691.2018.1537791

Denzin, N. K., dan Lincoln, Y. S. (2009). *Handbook of Qualitative Research*. California: Sage Publications.

Depdiknas. (2006). *Peningkatan Mutu Pendidikan Dasar Melalui Manajemen Berbasis Sekolah, Peran Serta Masyarakat, Pembelajaran Aktif, Kreatif, Efektif, dan Menyenangkan*. Jakarta: Ministry of National Education of the Republic of Indonesia. https://prioritaspendidikan.org/file/paket1.pdf

Depdiknas. (2010). *Rambu-rambu Pengembangan Kegiatan KKG dan MGMP*. Jakarta: Direktorat Jenderal Peningkatan Mutu Pendidik dan Tenaga Kependidikan. https://efullama.files.wordpress.com/2014/03/rambu-rambu-kkg-dan-mgmp-efullama.pdf

Djajadi, M., Sumintono, B., & Mislan, N. (2012). Usaha Guru Fisika dalam Mengembangkan Profesionalnya: Studi Kasus di Kota Makassar. *Jurnal Pengajaran MIPA, 17*(2), 226-237. DOI: https://doi.org/10.18269/jpmipa.v17i2.250

Djajadi, M. (2015). *Proses pembelajaran berterusan dalam peningkatan kompetensi guru fizik di Makassar Indonesia* (Doctoral dissertation, Universiti Teknologi Malaysia). DOI: http://doi.org/10.13140/RG.2.2.16035.30242

Emda, A. (2016). Strategi Peningkatan Kinerja Guru Yang Profesional. *Lantanida Journal*, *4*(2), 111-117. DOI: http://dx.doi.org/10.22373/lj.v4i2.1883

Emda, A. (2018). Kedudukan motivasi belajar siswa dalam pembelajaran. *Lantanida Journal*, *5*(2), 172-182. DOI: http://dx.doi.org/10.22373/lj.v5i2.2838

Fadli, Chaerul. (2015). *Teacher Competency Test Results, Teacher Capacity in Makassar is Low* (Hasil UKG, Kapasitas Guru di Makassar Rendah). https://gosulsel.com/2015/11/25/hasil-ukg-kapasitas-guru-di-makassar-rendah/ [Online accessed 03-04-2019].

Faisal, and Martin, S.N. (2019). Science education in Indonesia: past, present, and future. *Asia-Pacific Science Education, 5*(1), 1-29. https://doi.org/10.1186/s41029-019-0032-0

Fakrurridha, F., & Nurdin, N. (2020). Pelaksanaan MGMP Dalam Meningkatkan Profesional Guru Pendidikan Agama Islam. *Jurnal Serambi Ilmu, 20*(2), 238-255. DOI: http://dx.doi.org/10.32672/si.v20i2.1456

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., and Yoon, K. S. (2001). What Makes Professional Development Effective? Results from a National Sample of Teachers. *American Educational Research Journal, Vol. 38* (Iss.4), pp. 915-945. DOI: https://doi.org/10.3102/00028312038004915

Gunawan, I. (2015). Strategi Meningkatkan Kinerja Guru: Apa Program yang Ditawarkan oleh Kepala Sekolah. In *Prosiding Seminar Nasional Pengembangan Karir Tenaga Pendidik Berbasis Karya Ilmiah, Fakultas Ilmu Pendidikan Universitas Negeri Malang* (Vol. 23, pp. 305-312).

Guskey, T. R. (2000). *Evaluating Professional Development*. Thousand Oaks, California: Corwin Press Incorporated.

Hasanah, A. (2012). *Pengembangan Profesi Guru*. Bandung: CV. Pustaka Setia. http://digilib.uinsgd.ac.id/id/eprint/4126

Kurniawan, A. (2018). Tunjangan Profesi, Pendidikan dan Latihan Profesi (PLPG) Dalam Kinerja Guru SMA. *Jurnal Administrasi Pendidikan, 25*(2), 324-335. DOI: http://dx.doi.org/10.17509/jap.v25i2.15645

Lestari, W. (2015). Efektifitas strategi pembelajaran dan motivasi belajar terhadap hasil belajar matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA, 2*(3), 170-181. DOI: http://dx.doi.org/10.30998/formatif.v2i3.98

Little, J. W. (2003). Inside the teacher community: Representations of classroom practice. *Teachers college record, 105*(6), 913-945. DOI: http://dx.doi.org/10.1111/1467-9620.00273

Loucks-Horsley, S., Love, N., Stiles, K. E., Mundry, S., and Hewson, P. W. (2010). *Designing Professional Development for Teachers of Science and Mathematics* (3rd Ed.). Thousand Oaks, California: Corwin Press.

Mahsunah, D., Wahyuni, D., Antono, A., and Ambarukmi, S. (2012). *Kebijakan Pengembangan Profesi Guru* (Bahan Ajar PLPG). Jakarta: Badan Pengembangan Sumber Daya Manusia Pendidikan dan Kebudayaan dan Penjaminan Mutu Pendidikan, Departemen Pendidikan Nasional.

MGMP-IPA. (2018). *Laporan Hasil Pelaksanaan Musyawarah Guru Mata Pelajaran IPA SMP*. Makassar: Institute for Educational Quality Assurance in South Sulawesi Province, Indonesia.

Miles, M. B., dan Huberman, A. M. (1994). *Qualitative Data Analysis* (2nd Ed.). Thousand Oaks, California: Sage Publication, Inc.

Nielsen, H. D. (1998). Reforms to teacher education in Indonesia: Does more mean better? *Asia Pacific Journal of Education, 18*(2), 9-25. https://doi.org/10.1080/0218879980180203

Rahman, Abdul. (2016). *Teacher professional development in Indonesia: The influences of learning activities, teacher characteristics, and school conditions*. Doctor of Philosophy thesis, School of Education, University of Wollongong. https://ro.uow.edu.au/theses/4721

Renstra Depdiknas. (2010). *Rencana Strategis Departemen Pendidikan Nasional Tahun 2010-2015*. Jakarta: Kemendikbud RI.

Rosser, Andrew. (2018). *Beyond Access: Making Indonesia's Education System Work*. Victoria State Government: Lowy Institute. https://www.lowyinstitute.org/publications/beyond-access-making-indonesia-s-

Sari, E., & Lim, C. P. (2012). Design-based research: Understanding its application in a teacher professional development study in Indonesia. *The Asia-Pacific Education Researcher, 21*(1), 28-38. https://ejournals.ph/article.php?id=4295

Siswanto, Slamet, W., Darjatiningsih, I., and Mulyana, B. (2018). *Kurikulum Fisika SMA 2013*. Jakarta: Direktorat Pembinaan SMA, Dirjen Dikdasmen, Kemendikbud RI.

Sumintono, B., Wibowo, S. A., Mislan, N., & Tiawa, D. H. (2012). Penggunaan teknologi informasi dan komunikasi dalam pengajaran: Survei pada guru-guru sains SMP di Indonesia. *Jurnal Pengajaran MIPA, 17*(1), 122-131. DOI: http://dx.doi.org/10.18269/jpmipa.v17i1.251

Tanang, H., Djajadi, M., Abu, B., & Mokhtar, M. (2014). Challenges for Teachers in Developing their Teaching Professionalism: A Case Study of Secondary School in Makassar, Indonesia. *Journal of Education and Learning, 8*(2), 132-143. DOI: https://doi.org/10.11591/edulearn.v8i2.215

Thair, M., & Treagust, D. F. (1999). Teacher training reforms in Indonesian secondary science: The importance of practical work in physics. *Journal of research in science teaching, 36*(3), 357-371. DOI: https://doi.org/10.1002/(SICI)1098-2736(199903)36:3<357::AID-TEA8>3.0.CO;2-I

Thair, M., & Treagust, D. F. (2003). A brief history of a science teacher professional development initiative in Indonesia and the implications for centralized teacher development. *International Journal of Educational Development, 23*(2), 201-213. DOI: https://doi.org/10.1016/S0738-0593(02)00014-7

Van den Berg, E. (1992). A Unique Indonesian Program for In-service Education. In R. J. Bonnstetter (ed.), *Science Teacher Education*. (pp. 19-22). Lincoln, Nebraska USA: Center for Curriculum and Instruction University of Nebraska.

Widodo, A., & Riandi. (2013). Dual-mode teacher professional development: challenges and re-visioning future TPD in Indonesia. *Teacher development, 17*(3), 380-392. https://doi.org/10.1080/13664530.2013.813757