

PROBLEMS OF SCIENCE TEACHERS (SCIENCE AND BIOLOGY) IN TERMS OF QUALIFICATION AND COMPETENCE

Fuji Astutik¹⁾

¹Universitas Islam Negeri Walisongo Semarang, Ngaliyan, Semarang, 50185

fujiaastutik@walisongo.ac.id

INTRODUCTION

Teachers have a very vital function and part in the growth of the education sector, so it is necessary to develop a respectable teaching profession. The improvement of educational processes and quality is closely tied to teacher performance. One of the key elements in any effort to raise the standard of education is the effectiveness of the teachers themselves as instructors. Teachers are pioneers in developing top-notch human resources. Throughout the learning process, teachers interact directly with students in class. Quality students will be created by teachers who are themselves academically, technically, emotionally, morally, and spiritually mature. Because of this, it is essential to have a teacher who is highly qualified, competent, and committed to doing his professional tasks (Kunandar, 2007).

A crucial component of the educational system, particularly in schools, are teachers. If the relationship between teachers and students—which is at the heart of learning—is not of high quality, other factors like the curriculum, facilities, fees, and so on will be meaningless. Creating a competent teacher is not an easy job, it takes a long time for every teacher to have competence which must be reflected in attitudes, patterns and actions in everyday life. Competent teachers must have teaching readiness, for example preparing a syllabus, up to a lesson plan. Besides that, teachers must be able to interact with students in the teaching and learning process by mastering the subject matter and being able to use media according to various methods. A teacher must also be able to provide the right learning motivation to students so that students are interested and enthusiastic in participating in the learning process.

Due to the rapid advancement of information technology, teachers now play a more active role in the learning process than just serving as a source of knowledge for students to consume. The development of teacher expertise must therefore go beyond simply being the knowledge of instructional principles. It is the responsibility of the teacher to impart information on his charges in order for them to develop a variety of abilities, values, and attitudes that will help them become more mature and ideal individuals. As a result, there are a number of requirements placed on the instructor, one of which is that they possess a certain set of fundamental abilities.

According to Article 28 of Government Regulation of the Republic of Indonesia Number 19 of 2005 concerning National Education Standards, educators are required to possess academic credentials, competence as learning agents, physical and mental health, and the capacity to realize national educational objectives. Continuing from the National Education Standards above, it is stated in the Regulation of the Minister of Education of the Republic of Indonesia Number 16 of 2007 concerning Academic Standards and Teacher Competency that academic

qualifications are the minimum level of education that must be met by a teacher as evidenced by relevant diplomas and/or certificates of expertise in accordance with applicable statutory provisions. Competence, on the other hand, refers to the potential, knowledge, abilities, and attitudes associated to a certain profession that can be actualized and exhibited in the form of action or performance in order to carry out a particular vocation.

Further details are provided in the Regulation of the Minister of Education of the Republic of Indonesia Number 16 of 2007, which states that the four main competencies of pedagogic competence, personal competence, social competence, and professional competence comprise the entirety of this teacher competency standard. The fourth skill that is included in teacher performance. However, if the teacher's qualifications are not appropriate and the competencies that must be possessed by the teacher have not been fully mastered, it will cause its own problems. The problem of teacher quality in the learning process is increasingly complicated, when viewed from the qualifications and competencies possessed by these teachers. The result is that learning that emphasizes processes and products cannot be achieved optimally which is implied by the low competence of students in science and biology subjects. Therefore, it is important for prospective educators to understand various kinds of problems related to teacher qualifications and competencies as supplies so that when they enter the field later they can optimize their various competencies and minimize existing problems. Furthermore, this paper will discuss "Problems of Science Teachers (Science and Biology) (Qualifications and Competence)".

METHOD

In writing this paper, the author uses two methods.

1. Interviews, namely asking directly to informants about educational equity that occurs in the city of Bojonegoro.
2. Literature study, namely the use of writing materials sourced from reference books and websites.

RESULT AND DISCUSSION

Science Teacher Qualification (Science and Biology)

Teacher qualifications can be seen as jobs that require qualified abilities. Teacher qualifications differ according to each level. Both PAUD/TK/RA teachers up to the secondary education level are explained in Government Regulation Number 19 of 2005 concerning Teachers and Lecturers, Chapter IV Standards for Educators and Education Personnel Part One concerning Educators in Article 28, namely as follows.

In order to achieve national educational goals, educators must possess the necessary academic credentials, learning agent competencies, physical and mental health. According to the appropriate diplomas and/or certificates of expertise required by the laws and regulations that apply, the academic requirements mentioned in paragraph (1) are the minimal education level that an educator must possess. (2) A person can be hired as an educator after completing the due diligence and equality exam even when they do not possess the diploma and/or expertise certificate mentioned in subsection (2) but do have a specialization that is needed

and recognized. Furthermore, teacher qualifications are clarified again in Permendiknas Number 16 of 2007 as follows.

1. Teacher Academic Qualifications Through Formal Education

Teachers in formal education units must have the following academic credentials, including those of instructors at every educational level, including junior high school/madrasah Tsanawiyah (SMP/MTs) teachers and senior high school/madrasah aliyah (SMA/MA) teachers.

- a. Qualities of Middle/MTs Teachers Academically
Instructors at SMP/MTs, or other equivalent forms, are required to have at least a diploma level four (D-IV) or a bachelor's degree (S1) from a recognized study program that is relevant to the subject being taught.
- b. SMA/MA Teacher Educational Requirements
Teachers at SMA/MA, or other equivalent forms, are required to have a bachelor's degree (S1) or a diploma level four (D-IV) from a study program that is related to the subject being taught or aided.

2. Teacher Academic Qualifications Through Due Diligence and Equality Tests

The academic qualifications required to be appointed as teachers in special fields that are urgently needed but have not yet been developed in tertiary institutions can be obtained through a fit and equivalence test. The fit and equivalence test for someone who has expertise without a diploma is carried out by a tertiary institution that is authorized to carry it out.

Science Teacher Competency (Science and Biology)

Government Regulation Number 19 of 2005 covering Teachers and Lecturers, Chapter IV Standards for Educators and Education Professionals, outlines the competences that teachers are required to possess. Pedagogical competence, personal competence, professional competence, and social competence are all included in Part One of Article 28 Paragraph 3's section on educators, which is titled Competence as learning agents at the level of elementary and secondary education and education early childhood. Permendiknas Issue 16 of 2007 has the entire explanation, which will be detailed in the paragraphs that follow.

1. Pedagogic Competence

- a. Gaining a thorough understanding of students' qualities from the viewpoints of their physical, moral, spiritual, social, cultural, emotional, and intellectual elements.
- b. Acquiring knowledge of educational learning theories and practices.
- c. Create a curriculum that is connected to the subjects taught.
- d. Planning educational learning.
- e. Making use of information and communication technology to enhance learning.
- f. Assisting students in realizing their various potentials.
- g. Interact with kids in an efficient, sympathetic, and respectful manner.
- h. Assessing and analyzing the results of learning processes.
- i. Making use of test and evaluation outcomes to advance learning
- j. Reflective take action to raise the standard of learning.

2. Personality Competence

- a. Comply with Indonesia's national cultural standards and all applicable laws.

- b. Promote yourself as a sincere, admirable individual who serves as an example for both society and students.
- c. Demonstrate that you are a dependable, stable, wise, and powerful individual.
- d. Has a strong work ethic, a sense of accountability, a sense of accomplishment at being a teacher, and self-assurance.
- e. Maintain the teaching profession's code of ethics.

3. Social Competence

- a. Be inclusive, act impartially, and refrain from prejudice based on factors such as gender, religion, race, physical appearance, family history, and socioeconomic level.
- b. Interact with parents, the community, and other educators in a respectful, effective, and empathic manner.
- c. Adjust to the sociocultural diversity found on the Republic of Indonesia's entire area while performing your job.
- d. Interacting verbally, in writing, or through other means, with other professions and the professional community itself.

4. Professional Competence

- a. Acquiring a thorough understanding of the principles, theories, and scientific outlooks that underpin the disciplines being taught.
- b. Learning the fundamental skills and competency requirements of the disciplines being taught.
- c. Create creatively taught learning materials.
- d. By taking thoughtful action, develop professionalism in a sustainable way.
- e. Using information and communication technology to further your own development.

In Permendiknas Number 16 of 2007 it is stated that the competencies of science teachers (IPA and Biology) regarding mastering material, structure, concepts, and scientific mindsets that support the subjects being taught are as follows.

1. Competence of Science Subject Teachers at SMP/MTs

- a. Flexibly apply the IPA's theories, rules, and concepts after thoroughly understanding them.
- b. Acknowledging how natural scientists think while examining natural events and processes.
- c. Employing symbolic language to describe events and natural processes.
- d. Recognize the connections between different scientific disciplines as well as those between science, math, and technology.
- e. Use qualitative and quantitative reasoning to analyze basic natural laws and processes.
- f. Use scientific ideas, rules, and concepts to explain a variety of natural events.
- g. Describe how natural science laws, particularly those that are present in everyday life, are used in technology.
- h. Recognize the breadth and depth of academic science.
- i. Using creativity and innovation to develop and use IPA.
- j. Comprehending the theories and fundamentals of work/study management.
- k. Improving science instruction in the classroom and lab by using measuring devices, instructional aids, calculators, and software.

- l. Developing scientific experiments for research or educational objectives.
 - m. Conduct scientific experiments correctly.
 - n. Recognize the historical progression of science and the ideas that guided these advancements.
- 2. Competence of Biology Subject Teachers at SMA/MA, SMK/MAK**
- a. Understand the concepts, laws, and theories of biology and their application flexibly.
 - b. Using an understanding of biological thought processes to investigate natural events and processes.
 - c. Employing symbolic language to describe natural and biological events and processes.
 - d. Understand the structure (including functional relationships between concepts) in Biology and other related sciences.
 - e. Reason qualitatively and quantitatively about biological processes and laws.
 - f. Applying concepts, laws, and theories of physics, chemistry and mathematics to explain/describe biological phenomena.
 - g. Describe how biological laws are applied in biologically-related technology, particularly in applications that are seen in daily life.
 - h. Recognize the breadth and depth of academic biology.
 - i. Being inventive and creative in how biology and related sciences are used and developed.
 - j. Acquiring knowledge of management concepts and theories and work/study safety in the biology lab at school.
 - k. To improve biology learning in the classroom, lab, and field, use measurement equipment, visual aids, calculators, and computer software.
 - l. creating biological experiments for research or educational purposes.
 - m. Conduct biological experiments correctly..
 - n. Understanding the history of the development of natural sciences in general, especially biology and the thoughts that underlie these developments.

Problems of Science Teachers (Science and Biology) Relating to Qualifications and Competence

1. Issues Related to Qualifications

Problems with educators are also a factor in the low quality of education, including in the 3T areas. These educator problems include under-qualification and low competencies, as well as a mismatch between educational qualifications and the fields they teach (Ministry of Education and Culture, 2012). The results of research conducted by Murniasih, et al. (2013) showed that the academic qualifications of the teaching staff at this school were quite varied, namely: two people with D1 academic qualifications, one D2 person, eight D3 people, and eight people with S-1 academic qualifications. Of the eight educators who have bachelor's degree qualifications, three of them do not have a bachelor's degree in education. The same thing also happened in other areas, for example in one junior high school in Bangkalan Regency, teachers who teach science subjects do not have the appropriate educational qualifications, where the science teachers are teachers of other subjects, namely math teachers and ICT teachers. Kaniawati (2008) suggests that there is a

mismatch between educational background and teaching assignments, and there are still many science teachers who still have D3 education backgrounds.

Sultan in Wilujeng (2012) added that the quality of teachers nationally today is indeed quite concerning. The reality on the ground shows that there is a mismatch about the condition of science teachers in junior high schools. There are still many science lessons taught by teachers who are not graduates of S1 science education. Balitbang data from the Ministry of National Education for 2004 showed that at the junior high school level there were 108,811 public teachers and 58,832 private teachers out of a total of 466,748 teachers (35.9%) who were deemed unfit to teach.

The shortage of educators for certain subjects causes teachers to have to teach subjects that are not in accordance with the field they are in charge of (mismatched). This condition clearly does not meet the Academic Qualification and Teachers at SMP/MTs, or other equivalent forms, must have a minimum educational qualification of a diploma four (D-IV) or undergraduate (S1) study program in accordance with the subjects being taught/taught, and obtained from an accredited study program, according to the Teacher Competency Standards of the Republic of Indonesia Minister of Education and Culture No. 16 of 2007. These results also suggest that under-qualified instructors are one of the factors contributing to issues with the delivery of education (Ministry of Education and Culture, 2012).

The academic qualifications and discrepancies of the teacher's educational background will affect the learning process. With minimal knowledge and understanding of learning theories, methods and strategies, teachers tend to use one-way learning, away from PAIKEM, and this kind of learning has low effectiveness. In order to improve competitiveness, learning is needed to be more effective, and the dimensions of knowledge and cognitive process dimensions of learning are integrated in the domain of the four pillars of education. Continuous learning strategies must be reviewed so that in learning it makes students active, creative, fun, in order to successfully accomplish learning goals.

The expectations that have been expressed earlier will be easily achieved if teacher qualifications, which are defined as the skills needed to carry out professional duties, are always and continuously developed and improved. Because high teacher qualifications will have an impact on teacher performance in carrying out their professional duties, for example 1) knowledge of learning strategies, 2) class management, especially learning interactions, 3) motivation for achievement, and 4) professional commitment and work ethic are high.

2. Competency-Related Issues

a. The ability of science teachers to manage science learning processes is still low

The problem of science education is marked by the low achievement of students in science subjects. Various circles assume that the cause of low student achievement is due to the low quality of science education in schools. The UNDP United Development Project Report announced that in the Human Development Index (HDI), Indonesia was ranked 110th among various countries in the world. Other indicators are the low average EBANAS (NEM) and UAN (DANUAN) average scores and the results obtained from the TIMSS-R, Indonesia's position is ranked 32 out of 38 countries (Martin in Ayu, et al., 2011).

A contributing factor in the poor quality of science education is the inconsistency between the methods used to teach science and its fundamental principles. The study of science need to be focused on the method and outcome of science. This indicates that teaching students about science concepts and principles does not sufficiently advance science learning. When learning science, students must as fully as possible comprehend the way that natural scientific phenomena are experienced through sense. Thus, the learning idea known as "Hands-on and Minds-on activity" or "Hands-on and Minds-on activity" states that when learning science, students must actively watch, try, and discuss with peers and teachers. Only teachers who have a thorough understanding of both learning methodologies and science characteristics can implement the concept of learning science in this way.

Teaching science concepts to students continues to dominate field observations linked to the application of science learning. Teachers of science frequently express their frustration with the age-old issue of not having enough time or resources to implement the curriculum's requirements for science instruction. When asked whether practicum activities or observations of natural science objects were carried out during learning, the answer was that there was not enough time to do this. This indicates that the implementation of practicum or observation by science teachers is considered as an additional activity which is allowed to be carried out if there is time. Yet, such teaching methods ought to be used while teaching science. If a teacher consistently considers that science learning practicum exercises and observations are not requirements that must be accomplished, the phenomena of this type of science learning will persist.

Based on the assumptions of science teachers regarding science learning as described above, it indicates that the ability of science teachers is still low in managing the science learning process. This concerns the low quality of most science teachers. Science teachers should show professional teaching behavior in carrying out their duties. Because teachers who teach in a professional and effective manner will produce effective learning behavior and in turn will produce quality output (learning outcomes) (Surya, 2005).

b. The teacher's ability in compiling questions is still relatively low

One way to improve the quality of education in Indonesia is to implement all forms of agreed legislation. The legislation also mentions the various tasks of teachers, one of which is the evaluator. If examined further, assessment is closely related to learning because it is related to objectives, materials, and the learning process, so it can be said that the teacher's role as evaluator plays an important role in learning.

One of the results of research conducted by Nopitalia (2010) regarding the analysis of teacher-made test items, showed that the items created by the teacher were dominated at the C1 level, which means that many of the items focused on topics that are memorable in nature. The questions also focus on certain sub-matter, while the position of the sub-matter is the same. Some of the sub-materials become neglected and result in students' abilities not being measured optimally. Domination of items at the C1 level will later cause students' thinking abilities to be limited to memory which in the long term will impact on the development of students' brains to tend to remember only so that efforts to solve a problem or to find new things are very unlikely.

Judging from the suitability of the questions with the RPP, the maximum percentage was not obtained. The maximum percentage should be in it if the RPP is used as the basis for compiling questions because it contains indicators and learning objectives. RPP is only used as a complement to administration at certain times. RPP should be used as a reference so that it is hoped that the learning carried out will become programmed. Apart from that, the reality on the ground is that many teachers compile questions by taking questions from books or from the internet, not making them themselves. The preparation of these questions is related to the pedagogic competencies that must be possessed by teachers, namely developing a curriculum related to the subject being taught. Based on what has been stated previously, it can be concluded that the pedagogic competence related to the preparation of questions is still relatively low.

c. The ability to implement Integrated Science is still low

The results of research on the Program for International Student Assessment (PISA) regarding scientific abilities, Indonesia participated for three periods with the results that Indonesia was in 38th place followed by 41 countries, was in 38th place out of 40 countries, and was in 1st place -53 out of 57 countries (OECD, 2003; OECD, 2004; OECD, 2007). This is a manifestation of the application of educational and learning patterns carried out by teachers that are not in accordance with the demands and needs of students.

The results of research on the Science Teacher Professional Competency Study at SMP Kota Semarang conducted by Ayu, et al. (2011) provided information that the professional competence level of junior high school science teachers in the city of Semarang was in the low category, seen from an average of 5.85 on a scale of 0-10 or below 75% of the 100% expected score of teacher professional competence. Being a teacher is a career that calls for specialized training and cannot be performed by anybody who is not involved in education (Uno, 2008). For a teacher to perform his tasks in a professional manner, he or she must be aware of and able to use a number of teaching concepts. Also, teachers can conduct efficient assessments, use the findings to assess students' performance and growth, and make adjustments and advancements.

Teachers in subjects like physics, chemistry, and biology are typically found in schools. Due to the fact that teachers with this background are less adept at teaching Chemistry and Biology than those with a physics background, and vice versa, it is difficult for them to integrate the field of science studies. The concept of integrated science suffers as a result, which is reflected in how poorly it functions. Based on the results of interviews with the Bojonegoro City National Education Office, it provides information that the integrated science learning process is still separated between physics and biology. When it comes to physics subject matter, the teacher who teaches is a physics teacher, and vice versa for biology material.

Science instruction in junior high schools is described as being integrated in the 2013 Curriculum Development Guidelines. Junior high school science curriculums are constructed as integrative scientific courses rather than as academic subjects. Both types of education are practice-focused, fostering curiosity, critical thinking, and caring attitudes toward the natural and social environments. Integrative science refers to the blending of many elements, particularly those in the areas of attitudes, knowledge, and abilities.

d. Some Other Classical Problems

Based on a survey conducted by Syamsuri (2010) in collaboration with JICA produced several findings, including the following.

- 1) In general, teachers are still compiling curriculum (syllabus, lesson plans and worksheets) using the "copy paste" technique, which means they have not prepared syllabi, lesson plans and worksheets based on their own needs and conditions;
- 2) From the lesson plan analysis obtained, it turns out that there are differences between what is written and what is implemented in class. In the lesson plan the teacher writes down the use of a constructivist approach, the teacher acts as a facilitator, but from observations in class it can be seen that the teacher is more dominant, uses a lot of lectures, students are passive, and the teacher does not understand how to implement a constructivist approach in class as suggested by the 2013 curriculum.
- 3) Classroom management is carried out conventionally so that interaction between students is not possible, except for 2 junior high schools that use classroom management which allows mutual learning between students.
- 4) In conducting evaluations/assessments, teachers generally use written tests, so that tests are only oriented to the cognitive domain, only a few teachers use rubrics for assessments. This means that the teacher's understanding of the assessment is only in the cognitive domain, not up to the affective and psychomotor domains.

Effendi (2008) states that the obstacles in preparing lesson plans are as follows.

- 1) Time, this factor is the biggest (41.05%). Included in this factor include; teacher's difficulties in distributing time in lesson plans, and there is no time for teachers to make lesson plans because of their busy schedule, etc.
- 2) Difficulties in describing the subject matter in lesson plans (14.74%).
- 3) Difficulty following the standard lesson plan format (13.68%).
- 4) Difficulties in reference books (13.68%), difficulty in determining which books to use, mandatory books and supporting books.
- 5) Difficulty in determining teaching methods (8.42%).

One of the main tasks of the teacher is teaching. If the teacher can effectively arrange learning—from creating lesson plans to carrying it out in class to evaluating it—the learning process will proceed smoothly. A teacher must create lesson plans because they include crucial elements of the teaching and learning process. Examples of these aspects are the competences to be attained, the methods for doing so, the materials or subject matter, the interaction models, the evaluation models, and so forth. Kaniawati (2008) added several problems in learning science including the following.

- 1) The teacher's skill in making teaching aids is very low.
- 2) The worksheets used in learning are worksheets that have been made by certain publishers which are often not in accordance with the syllabus.
- 3) Teachers are less able to communicate concepts to students because of scientific language.

Solutions that can be Used in Preventing and Overcoming Science Teacher Problems (Science and Biology) Related to Qualifications and Competence

1. Qualification-Related Solutions

According to Effendi (2008), the existence of a teacher certification program is a concrete manifestation of the Teacher-Lecturer Law and SNP, which has an impact on teacher welfare, making teachers, especially those who have not had an undergraduate degree, try to increase their education level to S-1. The paths that teachers want and have already taken in an effort to improve their qualifications (school to a higher level) can be grouped into individual paths, through the school where the teacher teaches, through the education office, and other parties (in the form of scholarships). Currently, various regional governments have provided scholarships to local children to continue their education to a higher level at quality TTIs, so it is hoped that after completing their education at LPTKs they will have better competence and when they return to the regions they can advance education at least in their environment.

2. Competency-Related Solutions

a. Professionalism Development

Efforts to improve teaching skills, not only through education to a higher level but also through efforts to improve and develop the competence of the teaching profession. Especially for teachers who have many limitations, efforts need to be made, for example, participating in training, scientific forums/competitions, writing books/modules, writing articles, conducting research/PTK, making learning media or tools, and so on. Efforts to improve professional competence through education and training are mostly carried out, because these activities generally do not incur a lot of personal funds, do not interfere with class hours, teachers who take part in these activities are given many assignments by schools/national education, do not require heavy thinking compared to participating in scientific forums, competitions/scientific works, writing books/modules, writing articles, and making learning media/tools (Effendi, 2008). Teachers who are assessed as lacking competence should have the opportunity to attend training and education at the basic and advanced levels as an effort to increase their level of professional competence.

Their ability and willingness is quite high, even their age is not a barrier for teachers to increase the competency of this teaching profession. They are aware that this relatively inexpensive activity can improve teachers' ability to teach so that they can facilitate the achievement of predetermined learning competencies. Activities that improve teaching profession competence typically focus more on managing learning, which involves knowing students, planning and executing learning, evaluating learning, and helping students reach their full potential. Professional teachers are teachers who are able to manage learning in an active, creative, effective, and fun way (PAKEM) so that student competency can be achieved (Effendi, 2008).

Moreover, professionalism will also improve. It will be possible for students to be guided to reach the defined competency criteria since they will have a comprehensive and deep understanding of the learning material. This ability takes the form of: 1) mastering the subject matter and scientific methodology of the field,

2) mastering the curriculum's structure and content, 3) mastering and utilizing information and communication technology in learning, 4) organizing curriculum materials for the field of study, and 5) enhancing the quality of learning through classroom action research (Effendi, 2008).

The national education system is covered in Law of the Republic of Indonesia No. 20 of 2003 Article 39, as well as national education standards are covered in Government Regulation of the Republic of Indonesia No. 19 and the teaching law (Currently still in draft). The following will describe professional development at various levels.

1) Development of Professionalism at the School Level

Implementation of coaching at the school level is carried out by three elements, namely the Principal, school MGMP and Superintendent. The principal has two main functions, namely the bureaucratic function and the function of academic supervision. The role and supervisory function of the Principal is implemented in the form of providing assistance or professional development of teachers. In addition to the Principal, at the School level there is a Supervisor, who also has a role in providing assistance services to teachers in the context of academic supervision. Supervisors should have a deep understanding of learning as an advance teacher, therefore a science teacher supervisor should be someone who understands the ins and outs and problems that are often encountered in science learning (Riandi, no years).

The Science Subject Teacher Conference (MGMP Science, MGMP Biology, MGMP Chemistry, MGMP Physics) is a non-structural forum for developing the teaching profession. The school's MGMP consists of teachers of similar subjects at the school. Professional development activities are especially emphasized on increasing the ability and skills to carry out quality science learning. The professional development carried out by the MGMP can be in the form of encouragement to each teacher to carry out learning research activities in the form of Classroom Action Research (CAR). PTK is part of the implementation of learning Research and Development (R & D) activities at the school level. Through this PTK, it is possible for teachers to carry out a self-renewal process (Riandi, no years).

2) Professional Development at City/District Education Office Level

At the regional and city levels, there are elements of supervisors, both structural and non-structural. Regional MGMPs are a forum for the professional development of teachers who have non-structural access to School MGMPs, as well as City/District Central MGMPs to Regional MGMPs. The activities carried out are almost the same as the School MGMP, only access is wider so that they can submit activity proposals to the City/District Office related to increasing teacher professionalism. The City MGMP is a strategic forum for developing teacher professionalism because it consists of teachers of similar subjects from all schools of the same level. In the current conditions, it is very possible to form a teacher's association as a place to solve the problems of teachers' weaknesses and needs in order to foster teacher professionalism. Through this association "sharing ideas" can be carried out in improving the quality of science learning (Riandi, no years).

3) Development at the Central/Provincial Level

Each province has an Education Quality Assurance Agency (LPMP). This institution is a technical implementing unit (UPT) for quality assurance of education

under the Directorate for Quality Improvement of Educators and Education Personnel. In its capacity as a quality supervisor for educational staff, this institution should play a role in formulating quality standards and conducting quality tests for teacher professionalism. This UPT is also planned to organize a teacher certification program which will become a license for someone to qualify to become a teacher. Apart from LPMP under the auspices of the directorate, there is PPPG which is a UPT which is engaged in improving the quality or competence of teachers in accordance with their fields (Riandi, no years).

4) Development Through Professional Organizations

In addition to coaching carried out by structural institutions, there are still professional teacher advisory bodies, including PGRI and HISPIPAI. PGRI is the largest teacher organization body which consists of all teachers from various levels of the school. This organization carries out the function of developing teacher professionalism through pioneering the preparation of various rules, legislation, teacher rights and obligations as well as legal aspects relating to the protection of the teaching profession. HISPIPAI stands for Association of Indonesian Science Education Scholars and Observers. This organization fosters the professionalism of science teachers through periodic seminars and workshops. One of the ideas in teacher professional development can be done through total school reforms. In implementing this idea, it must begin with a shared commitment among the various components of education reformers. The reformer components are the school principal, teachers, students, parents, education experts (from TTIs or other sources), bureaucrats (Riandi, no years).

Analyzing, diagnosing, and predicting educational issues are skills that professionals teachers must possess. Among other things, teachers with professional competence need to be proficient in: a) scientific fields as a source of learning substances; b) teaching materials taught; c) understanding of student characteristics; d) knowledge of philosophy and learning objectives; e) knowledge and mastery of learning techniques and models; f) mastery of the learning principles and technology; g) knowledge of assessment; and be able to plan and lead for the efficient operation of the educational process. The demand for this competency encourages teachers to obtain information that can enrich their abilities so they don't fall behind in their professional competence (Ayu, et al., 2011). Syamsuri (2010) added that there is still a need for Inservice Training for teachers (in-service teacher development) in the form of assistance by experts.

b. Lesson Study

Various efforts have been made by various parties to improve the competence of teachers who are already working (in-service training), including through teacher training, for example the Teacher Work Strengthening (PKG) training in the 80s which was followed by the LKGI model PKG (Core Teacher Work Training). and the MGMP (Subject Teacher Deliberation) model in the late 90's, Competency-Based Integrated Training (PTBK) in the mid-2000's, and other training conducted by NGOs, LPM Higher Education, and Professional Organizations (Purwana, 2007).

According to Syamsuri (2010), the government has made every effort to conduct inservis training by holding workshops, training sessions, and upgrades in a short period of time so that teachers can leave their classes, but once the teachers

return to the classroom, they fail to put their newfound knowledge to use in a way that promotes effective learning. The same thing was also expressed by Purwana (2007) who stated that referring to indicators of evaluation results carried out by various institutions, both formal institutions for example by UNDP-UNESCO, and informal institutions for these training activities, where the evaluation aspects include aspects of context, input, process, the results and impacts of the activities, show that the results of the training in general have not had a significant impact on increasing teacher competence.

In order to address these issues, it appears that the need for coaching through an efficient system of planning, implementing, and assessing the execution of teacher preparation is still present. This is predicted to result in an increase in teacher competence. Lesson study is an alternative method. Lesson Study is a framework for advancing the teaching profession through collaborative and ongoing assessment based on the ideas of collegiality and reciprocal learning to create a learning community (Purwana, 2007).

Lesson Study is a collaborative process where a group of teachers from various subject areas discuss, examine, and resolve problems together. The chosen answers are then presented in a learning design and implemented. As a result, different techniques, methods, and learning strategies can be used in lesson study activities depending on the circumstances, issues, and challenges the instructor is facing. Lesson Study is conducted in three steps, namely Plan (plan), Do (implement), and See (reflect), such that it is a method of continuously raising the caliber of instruction (continuous improvement).

Lesson study activities like what has been done will provide benefits for teachers such as increasing teacher knowledge about teaching and learning materials, increasing teacher knowledge about how to observe student activities, strengthening collegiate relations between teachers and observers other than teachers, strengthening the relationship between the implementation of daily learning with long-term learning objectives, increasing teacher motivation to continually develop, and improving the quality of lesson plans (including its components such as teaching materials, hands-on and minds-on-based teaching materials, and learning strategies (Purwana, 2007).

Other benefits of Lesson Study as expressed by Syamsuri (2010) include the teacher in the end: being able to compile creative and learning lesson plans and worksheets, the model teacher is not afraid of being observed by any party, the teacher is not hurt but rather happy to get input, the teacher does not badmouth each other but constructive solutions emerge, the teacher pays more attention to the rights of each student to learn, students feel happy, students enjoy expressing opinions and are creative, students learn from each other, and student achievement eventually increases. The students end up enjoying abstract subjects that are always considered difficult. Likewise, students end up enjoying science subjects because they are challenged to be creative in a fun atmosphere.

c. Opening the Science Education Study Program (LPTK)

Since 2005, the Ministry of National Education has developed standards for the development of integrated science learning; however, practically all SMP/MTs science instructors still do not use integrated science learning in the classroom for a variety of reasons. According to the findings of a study conducted in one of the

regions, there are a number of reasons why integrated science learning is not currently being used, including teachers' concerns that the curriculum's content will not be adequately communicated, the lack of examples of integrated science learning in many textbooks, and the lack of steps for establishing integrated science learning for the students. SMP/MTs instructors (Wilujeng, 2012).

Wilujeng (2012) suggests that science instructors should have knowledge of multiple scientific fields. The need for science teachers to be proficient in teaching science in an integrated (integrated) manner—including integration within the science field, integration with other fields like technology and health, and integration with the development of attitudes, scientific processes, and scientific skills—lies at the root of this. Based on the condition of the lectures that have not effectively prepared students as prospective SMP/MTs science teachers and to respond to and follow up on government policies, especially the Ministry of National Education regarding integrated science learning, it is imperative that LPTKs that open science education study programs develop integrated science programs to equip competence of student educators.

d. Education for Prospective Science Teachers

The learning experiences that must be sought so that the ability of prospective teacher students in selecting, organizing, packaging, and presenting science subject matter materializes in the educational process of prospective teachers, is by:

- 1) examine the substance, scope, and sequencing of science teaching materials for each grade level in the Middle School Curriculum.
- 2) Examine textbooks for science subjects in junior high schools.
- 3) Practice selecting, organizing, presenting science teaching materials in the junior high school curriculum in accordance with the learning objectives, grade levels, and learning needs of students.
- 4) Practice designing and developing science teaching materials in the Middle School Curriculum in accordance with the learning objectives, grade levels, and learning needs of students in the context of achieving the overall educational goals, and
- 5) Practice relating science subject matter to others and linking science subjects to everyday life.

In the National Science Education Standards at the National Academy of Science the two competency clusters are called scientific competence and pedagogical competence. Mastery of the two competency clusters is to describe the quality of teachers in the field of science being taught and the field of teaching or pedagogy. An indication of a qualified teacher is when they are experts in both the subject matter they are teaching and how to teach it. By meeting the standards for professional instructors, a teacher who was formerly a verbalistic orator will transition into a dynamic force in fostering an environment and learning environment that is conducive.

e. Certification

The availability of quality teachers—those who are competent, affluent, and dignified—is essential for the provision of high-quality education. Therefore it is entirely appropriate if the government wants to boost teachers' professionalism

while leaving other variables alone. Teacher certification is one method used to raise teacher professionalism. The objectives of teacher certification are:

- 1) Identify the viability of teachers fulfilling their responsibilities as learning agents and achieving national educational goals.
- 2) Increasing the efficiency and standard of educational results.
- 3) Enhance the respect for educators.
- 4) Raise the level of professionalism among educators.

The benefits of teacher certification are protect the teaching profession from incompetent practices that could damage the image of the teaching profession, protecting the public from unqualified and unprofessional educational practices, and improving the welfare of teachers.

The implementation of in-service teacher certification can be done in two ways, namely (1) teacher portfolio assessment and (2) educational path.

- 1) A portfolio of documents that demonstrate a teacher's proficiency in a range of subjects is evaluated. It's just that, this portfolio assessment contains weaknesses and teachers who are after a salary deal with portfolios in various ways that are contrary to educational principles. Teachers who have not passed certification through the portfolio route are required to take part in the Teacher Professional Education and Training (PLPG).
- 2) Through the PPG line.

In-service teacher certification for teachers who have met academic qualification standards, namely a minimum formal education of Bachelor (S1) or Diploma 4 (D-4) will be carried out through portfolio assessment as a form of competency test to assess how far the teacher in question has mastered the minimum competencies required according to the Regulation of the Ministry of National Education Number 16 of 2007 about Academic Qualification Requirements and Teaching Competence. Through the teacher certification program, professional teachers will be developed, i.e., teachers who have at least met academic and competency qualification standards. These teachers will receive a professional educator allowance equal to one time of the basic salary, with the hope that their top-notch performance will result in the realization of high-quality national education (Djaali, 2007).

On the other hand, it is challenging to achieve optimal performance and will not have an impact on raising the standard of public education to provide welfare to instructors who do not meet academic qualification and competency standards. Consequently, offering professional educator allowances to all instructors who are not certified as a part of welfare will not have an impact on raising teacher performance or, by itself, raising the standard of education in the country (Djaali, 2007).

This explanation makes it obvious that if certification can be done in a valid and objective manner, it will improve teacher performance, which will then improve the quality of national education. This means that only instructors who have met the academic qualifying standards and who possess the minimum necessary competences will be awarded teacher professional certifications, and this will only be possible if the certification program is conducted in a genuine and unbiased manner (Djaali, 2007).

Certification through competency tests can actually also be carried out through written tests to assess mastery of competency standards and basic subject competencies according to each teacher's field of work, and assess theoretical mastery of pedagogical competencies. Assessment of pedagogical competence in practice is carried out through class observation by assessors from tertiary institutions administering certification, while assessment of personality competence and social competence can be carried out through portfolios, assessments of superiors and colleagues which take place continuously in carrying out daily professional tasks, both in class and in the school environment and in everyday life in society. For teachers in positions that do not meet academic qualification standards, they still have to take part in a qualification improvement program in order to meet the academic qualifications required before taking certification, either through portfolio assessment or competency tests as described above to obtain a teacher professional certificate (Djaali, 2007).

CONCLUSION

The minimum educational requirements for science and biology teachers are a diploma level four (D-IV) or an undergraduate degree (S1) from an authorized study program, depending on the subject being taught or aided. Pedagogic, professional, social, and personality competences are among the qualities that science instructors (IPA and Biology) must possess. The problems of science teachers (Science and Biology) are related to qualifications, namely underqualification and mismatch, while problems related to competence include the ability of science teachers to manage the science learning process which is still low, the ability of teachers to compose questions is still relatively low, the ability to carry out integrated science is still relatively low, and so on. Solutions that can be used to prevent and overcome the problems of science teachers (IPA and Biology) related to qualifications, namely by continuing the level of education according to demands, providing scholarships to local children to study at a higher level, and establishing the SM3T program, while solutions related to competency issues include conducting professional development, PPG, certification, opening science education study programs (LPTK), lesson studies, and so on.

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