Myint Swe Khine
Yang Liu *Editors*

Handbook of Research on Teacher Education

Innovations and Practices in Asia

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Myint Swe Khine is an Adjunct Professor at Curtin University, Australia. He has more than 30 years of experience in teacher education. He received Master's degrees from the University of Southern California, USA, University of Surrey, UK, and the University of Leicester, UK, and a Doctoral degree from Curtin University, Australia. He worked at the National Institute of Education, Nanyang Technological University, Singapore, and Emirates College for Advanced Education in the United Arab Emirates. He has wide-ranging research interests in teacher education, science education, learning sciences, psychometrics, measurement, assessment, and evaluation. He is a member of the Editorial Advisory Board of several international academic journals. Throughout his career, he has published over 40 edited books. These include *Large Scale School Reform and Social Capital Building* (Routledge, 2013), *Emerging Trends in Learning Analytics* (Brill, 2019), *Contemporary Perspectives on Research in Educational Assessment* (Information Age Publishing, 2020), and *Rasch Measurement: Applications in Quantitative Educational Research* (Springer, 2020).

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Chapter 10
Teacher Education Research and Development in Indonesia: Preparing Educators for the Twenty-First Century

Bambang Apriady Loeneto, Zahra Alwi, Ernalida Ernalida, Eryansyah Eryansyah, and Santi Oktarina

Abstract This chapter aims to describe main problems in Indonesian context related to the educational research on teachers' teaching ability and their low professionalism related to competence and professionalism, theoretical review on educational research approach, teaching profession in the twenty-first century, teacher professionalism development and strategy, professional teachers in the era of Industrial Revolution 4.0, government efforts to improve teacher professionalism by giving an example of *PPG* program (*Pendidikan Profesi Guru*—Teacher Professional Education), classroom action research conducted by the *PPG* participants. The CAR is an activity carried out by the *PPG* participants in order to improve their teaching competency. The government's efforts to continue to develop the teaching profession as a strong and respected profession can be seen from the issuance of Government Regulation No. 14 of 2005 concerning teachers and lecturers who seek to develop the teaching profession through legal protection. Other efforts made by the government are the certification program, and the establishment of the *Pusat Kerja Guru*—Teacher Activity Center (*PKG*), *Musyawarah Guru Mata Pelajaran*—Subject Teacher Conference (*MGMP*), and *Kelompok Kerja Guru*—Teacher Working Group (*KKG*).Teachers in the twenty-first century are facing more complex and difficult challenges of their works, for example, an increasing diversity of students and parents, a higher demands of education quality, the higher standard of teaching and learning process and outcomes, etc. Looking back to the previous era, a professional teacher today should have a wider range of teaching competencies, such as teaching and managing class effectively; building, developing, and managing the relationship with students and school community; using technology for more effective communication and instruction; and also becoming a continuous professional learner to adjust himself/herself to the rapid changes and demands of his or her school environment. Consequently, teachers need an effective teaching development to provide helps and support for their professional development. Through CAR, teachers can conduct research on the actual problems they face for the subjects they teach. Teachers

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can immediately take actions to improve or improve learning practices that are less successful in order to become better and more effective in their future teaching and learning in the classroom.

Keywords Teacher · Teacher development · Teaching competency · Teacher professionalism · *PPG* program · Classroom action research

Introduction

In an effort to develop national education in Indonesia, teachers are very much needed in a guaranteed quality standard of competence and professionalism. To achieve the number of professional teachers who can drive dynamics progress in national education requires a guidance process sustainable, right-on target, and effective. Process towards this professional teacher needs to be supported by all elements related to the teacher. In other words, the Indonesian teachers must have the necessary talent, interest, zeal, idealism, commitment, faith, piety, and a noble character. For teachers to be able to develop these attributes, they must undergo formal teacher education before they are certified as qualified teachers.

In line with government policy, the Regulation of the Government of Republic of Indonesia No. 14 of 2005, Article 7, mandated that the empowerment of the teaching profession be carried out through self-development that is carried out in a democratic, just, non-discriminatory manner, and sustainable by upholding human rights, religious values, cultural values, national pluralism, and professional code of ethics. Besides, obeying Article 20, in carrying out professional duties, teachers are obliged to improve and develop academic qualifications and competencies sustainable in line with the development of science, technology, and art. Keeping in mind the weight and complexity of building education, it is very important to make efforts to encourage and empower educators to be more professional. This is to emphasize that for making efforts to build education strong and able to continue making improvements towards a higher quality.

The professionalism of teachers and education personnel is still inadequate especially in terms of scientific fields. For instance, a biology teacher can teach chemistry or physics subjects. Or social studies teachers can teach Indonesian. Quality and the professionalism of teachers is not yet in line with expectations. Many of them are not of high quality and convey the wrong material so they are less able to provide true education quality. The teaching skills of the teachers in Indonesia from several studies are still questionable, such as reported by Loeneto et al. (2019) their meta knowledge (referring to the skills of problem-solving, critical thinking, communication and collaboration, and creativity and innovation) show on the average only 49.85% of the teachers applied the skills.

Meanwhile, the assessment carried out by the Chairman of the Executive Board of the Indonesian Teachers Association (*PB PGRI*) shows the unsatisfactory results of UKG (Teacher Competency sTest) as follows: in 2015, the national average score for

kindergarten teachers was 43.74 points. Primary school teachers had 40.14 points, junior high school teachers 44.14 points, and senior high school teachers 45.38 points. In other words, the recruited teachers were 50% less than the expected standard results. Furthermore, until the 2017 UKG, the average score did not yet reach 70 points. Still in 2020, the national average of UKG score was below the standard.

Director General of Teachers and Education Personnel of the Ministry of Education and Culture stated that so far the government has only had a portrait of the Teacher Competency Test (UKG) for 1.6 million teachers. The minimal passing score for UKG test was 66 (scale of 1–100). Pathetically, there were only 192 people whose competence was above 90, meaning that it was only 8.33% achieving the required standard competency of the teachers.

According to Supranata, the average UKG score was 4.7. In 2018, the strategic plan target was an average UKG score of 5.5. Later in 2019, the average teacher competency would be expected to be 8.0.

Educational Research on Teachers' Teaching Ability and Their Low Professionalism

In Indonesia, education is the right of every citizen. Carrying out education is one of the state's services to its citizens (a public service obligation), aiming to educate them. Education is an important thing that must be considered by the state.

Education is a formal way by the state to educate citizens, so that competitive human resources will be produced. The educational process will produce intellectuals, politicians, scientists, statesmen, teachers, and other professions.

Equality problems can occur due to the lack of coordination between the central governments and regional governments, even in remote areas. This has resulted in disconnection of communication between the central government and the regions.

In addition, the problem of equitable education also occurs due to the lack of power of an educational institution to carry out the educational process, and this could have happened if the education controls carried out by the central and regional governments did not reach remote areas.

In Indonesia, to be professional a teacher must have four competency standards stipulated by the Regulation of the Republic of Indonesia Number 14 of 2005 concerning Teachers and Lecturers (hereinafter abbreviated to *PP* No. 14 of 2005) in Chapter IV Article 8.

1. Professional competence, namely the ability of a teacher to carry out matters related to professionalism which can be seen in his ability to develop responsibility, carries out roles well, strives to achieve educational goals, and carries out his role in classroom learning.
2. Pedagogic competence is to master and understand character and identify the potential and learning difficulties of students. Teachers must also be able to

develop curricula in order to create attractive learning designs and utilize technology and information for educational purposes.
3. Social competence, namely the ability of teachers to interact with students, parents, colleagues, and the environment, either directly or indirectly.
4. Personality competence, namely the ability to model a positive attitude.

Students have a desire to make it easier for them to understand the lesson. To achieve this successfully, a professional teacher can do it if she/he is able to involve students in the learning process, be able to treat them fairly and be able to distinguish the differences between each student, able to master the field of knowledge being taught, and relate it to other subjects and relate it to the real world, able to create, enrich, and adapt teaching methods that are of interest to students, and finally able to combine personality competence and social competence.

Another study by Rahma et al. (2020) indicated that teachers' perception of ICT use in teaching and learning process was positively good and it claimed to help both the teachers and students to learn easily since the material is easily accessed through the Internet. In addition, the problems faced by the teachers and students in using the ICT in the classroom showing that while they believed that ICT could bring positive impact on teaching and learning process, there was an insufficient number of computers provided by the school. Somehow, the number of computers was limited. Many of them had no personal computers. Thus, if they needed the computers, they had to go to the ICT Laboratory. The trainings and workshops were only burdened to the senior teachers.

Mulyasa (2007) state that teacher professionalism in Indonesia is still very low, this is because there has been no change in teaching patterns and conventional systems to the competency system and high teacher workloads, and there are still many teachers who have not conducted classroom action research. A study by Syaidah et al. (2018) on teachers' pedagogical competence and professional competence showed that teacher competence provides a contribution proportion of 80.2% to learning outcomes. In other words, successful students learning results quite depend on teacher competence.

Research in the Field of Education

Educational research refers to the systematic collection and analysis of data related to the field of education. Lodico et al. (2010), and Anderson et al. (1998) point out that "research may involve a variety of methods *and* various aspects of education including policy, principal leadership, infrastructure, and the learning process. The most important thing policy, especially the one that applies nationally: the curriculum and national examinations. Other important things to take into account comprise teacher distribution and recruitment policies as well as student learning, teaching methods, teacher training, and classroom dynamics".

Educational researchers generally agree that "research should be rigorous and systematic (Anderson et al. 1998)". Yet, according to Lodico et al. (2010), Lodico et al. (2010), Kincheloe (2004), there is less agreement about specific standards, criteria, and research procedures. Many educational researchers possibly apply various disciplines such as psychology, sociology, anthropology, and philosophy (Lodico et al., 2010; Yates, 2004). Furthermore, Yates (2004) and Kincheloe (2004) point out that methods may be obtained from a range of disciplines. Still, according to Yates (2004), "conclusions taken from an individual research study may be limited by the characteristics of the participants who were studied and the conditions under which the study was conducted".

There is no single "correct" way of conducting research in the field of education. Anderson et al. (1998) outlined ten aspects of educational research as follows: such as.

(1) "Educational research attempts to solve a problem.
(2) Research involves gathering new data from primary or first-hand sources or using existing data for a new purpose.
(3) Research is based upon observable experience or empirical evidence.
(4) Research demands accurate observation and description.
(5) Research generally employs carefully designed procedures and rigorous analysis.
(6) Research emphasizes the development of generalizations, principles, or theories that will help in understanding, prediction, and/or control.
(7) Research requires expertise—familiarity with the field; competence in methodology; and technical skill in collecting and analysing the data.
(8) Research attempts to find an objective and unbiased solution to the problem and takes great pains to validate the procedures employed.
(9) Research is a deliberate and unhurried activity which is directional but often refines the problem or questions as the research progresses.
(10) Research is carefully recorded and reported to other persons interested in the problem".

Approaches

Different purposes affect the nature of the respective research. There are different approaches—basic approach referred to as an academic research approach and applied approach referred to a contract research approach as pointed out by Lodico et al. (2010) and Anderson et al. (1998). In addition, basic or academic research focusses on the search for truth, meaning it concerns with the development of educational theory. The researchers design studies that can test, refine, modify, or develop theories. In general, they are affiliated with an academic institution and are performing this research as part of their graduate or doctoral work.

Teaching Profession in the Twenty-First Century

In the era of the Industrial Revolution 4.0, there is an increase in professionalism regarding the attitudes and commitment of teachers to always improve their quality to have competence in lines with the times. Besides, the main task of the teachers is to educate, teach, guide, direct, train, assess, and evaluate each student. Therefore, the teaching profession is very important.

The Indonesian Ministry of Education and Culture (Kemendikbud) stated that professionalism for a teacher is a necessity that must be fulfilled and used as the main guide in teaching at any level and educational unit. The professionalism of a teacher is also inseparable from fulfilling the competency standard requirements that have been regulated in regulations including the Regulation of Ministry of National Education Number 16 of 2007. To put in a different way, teachers are given the opportunity to develop their potential with students. Therefore, there is a demand for literacy programs in schools which are developed for students as well as an effort to improve teacher professionalism over time.

With the existence of this literacy program, the community labelling of schools such as superior schools or luxury schools and so on which refer to certain schools does not become an obstacle for teachers in strengthening their professionalism with certain patterns.

In fact, the Ministry of Education and Culture is currently developing a teacher competency model so that educators have strong knowledge content in learning. Moreover, in future, continuous professional development will be implemented which requires teachers to continue to improve their abilities and must not stop at certain professional or achievement limits. Teachers must always develop their potential, act as active learners, then be active in the community, and actively collaborate and share information.

In the twenty-first century, teacher work is a complex and difficult job in line with the large and rapid changes in the school environment that are driven by advances in science and technology, changing demographics, globalization, and the environment. Teacher competence in the twenty-first century, professional teachers are no longer just teachers who are able to teach well but teachers who are able to become learners and agents of school change, and are also able to establish and develop relationships to improve the quality of learning in their schools.

In the twenty-first century, humans experience the development of science in all fields. One of the most prominent is the field of information and communication. This seems to make the world have more time because all information from around the world can be accessed instantly and quickly by anyone, anywhere. On the other hand, in the twenty-first century, the problems faced by humans are increasingly complex, such as global warming, global economic crisis, terrorism, racism, drug abuse, human trafficking, low multicultural awareness, gaps in the quality of education, not to mention the pandemic of 2019 coronavirus disease. This era is also marked by increasingly intense competition in various fields between countries and

between nations. All of these things indicate that in the twenty-first century, thorough preparation and solid both concept and application are needed to form superior human resources. For this reason, educational institutions and teachers as the most dominant elements have a significant role in efforts to improve human resources in the twenty-first century.

The teacher paradigm from professional teaching has turned into professional learning, meaning that teachers are not just teaching but also continuously learning (continuous professional learning). Teachers are reflective practitioners who are a key part of evaluating teacher performance in many countries. Reflection starts from describing experiences, understanding and feeling the situation, evaluating and analysing, coming to conclusions, and formulating action plans. Teachers must be able to recognize gaps in their competence as material for compiling self-development plans and undertaking independent learning. Independent learning is an active learning activity, driven by motivation to master competencies and built with the knowledge that is owned. Independent learning has 3 dimensions, namely a social dimension, a pedagogical dimension, and a psychological dimension. Independent learning is done in a way: (1) diligent, continuous, and non-stop, (2) consistent, steady, disciplined, and unreasonable, (3) planned and competency-oriented, (4) focussed on achieving goals, (5) innovative or using new methods, (6) there is a clear follow-up, and (8) it is carried out throughout life. Skills in independent learning contain three main concepts, namely: (a) independent learning, (b) independence, and (c) psychological control. Independent learning can transform a teacher's self-culture and become part of continuous professional development.

A study by Aminullah et al. (2019) shows that the attitudes of the teachers towards the use of ICT in the process of teaching and learning English were positive. However, some of them still faced many problems such as lack of ICT equipment, lack of competency, and also unsupported regulation from the institution. This study indicated that in line with the development of technology, particularly ICT, though the study results showed that the teachers had positive attitude towards ICT use, the teachers and schools had problems in applying technology in their classrooms and schools. These constraints came from the institutions or schools—lack of ICT facility and also from the teachers themselves—not understanding how to operate ICT devices properly. Their schools did not have an ideal regulations towards the use of ICT, especially for English subject, and some schools also did not have enough ICT, while some teachers lack knowledge of ICT necessarily needed in their teaching and learning process in the classrooms.

The challenges of education in the twenty-first century are getting tougher. This requires increasing professionalism regarding the mental attitude and commitment of teachers, especially to improve quality so that they have competencies that are in line with the times.

This above matter is related to the Industrial Revolution 4.0 which has penetrated all sectors. So, it must be addressed wisely because it has fundamentally changed human civilization. Professional teachers will be able to take advantage of advances in information technology, to improve the quality of the teaching and learning process in order to prepare superior human resources.

The task of teachers as educators is to gradually but firmly establish the basic values of character development of students in their lives, including the use of advances in information technology wisely and as an inspiration for their students.

A study by Loeneto et al. (2019) shows that the proficiency of teachers of English in using computers in the teaching and learning process and proficiency of students in using computers in their learning process fall in the categories of novice or moderate users of computer literacy. Half of the majority of the teacher respondents recorded their classroom observation and any inappropriate code of conduct. The remaining teacher respondents stated that in doing these tasks they considered themselves belonging to the novice or moderate or level of proficiency. More than half of the teachers stated that they were in the moderate and expert level of proficiency in doing the tasks of monitoring students' achievement data, students' grades, preparing classroom evaluations, and searching sources of the curriculum. Forty-two per cent to sixty-three point three of the responding teachers stated they were at the moderate or expert level of proficiency in preparing school scheduling template, curriculum, graphs, and charts.

To prepare student teachers to develop their skills and knowledge they do require is not an easy effort since in future these skills and knowledge are not always the same. According to Schleicher (2018), the teachers face difficulty. Challenges of twenty-first century require teachers to be passionate, compassionate, and thoughtful so that they will feel valued and included in a collaborative learning environment.

Teacher Professional Development

Educators or teachers as the main agents in the development of national education are required to have quality standards of competence and professionalism. Professional teachers are not yet sufficient enough so that it needs a process to move the dynamics of national education progress continuously, on target, and effectively (Dasuki, 2010). This process requires support from all parties related to teachers in order to successfully meet the needs of professional teachers.

Enactment of the policy of Regulation No. 14 of 2005 Article 7 is one of the government's efforts in realizing teacher professionalism stipulating that the empowerment of the teaching profession is carried out through self-development carried out in a democratic, fair, non-discriminatory, and sustainable manner to uphold human rights, religious values, cultural values, national pluralism, and professional code of ethics (Dasuki, 2010). Article 20 concerning professional duties states that teachers are obliged to improve and develop academic qualifications and competencies on an ongoing basis in line with the development of science and technology (Dasuki, 2010).

The policy is intended to empower and improve the quality of teachers in a planned, directed, and sustainable manner so that the teaching profession needs to be developed as a profession that is prosperous, dignified, and protected (Komara, 2016). Teachers can professionally carry out their duties safely because these policies are the basis for teachers to take steps to develop their professionalism as educational agents.

Teacher Professional Development

Teacher professional development is a process of activities in order to adjust the professional abilities of teachers to the demands of education and teaching. The development of the teaching profession in the educational environment is directed at professional quality, objective performance appraisal, transparency and accountability, as well as motivating to improve performance and achievement (Putri & Imaniyati, 2017). Professional development of teachers as part of improving the teacher competence quality is expected that teachers have to have the expertise, skills, or skills that meet certain quality standards or norms.

Professional development is the teachers' activity in the practice of science and knowledge, technology, and skills to improve quality, both for the teaching and learning process and the professionalism of other education personnel. Further, Putri and Imaniyati (2017) point out that professional development is a personal improvement made by a person to achieve a professional plan. In other words, profession is an ordinary position or job as is the case with other jobs. Therefore, the development of the teaching profession is an important thing to pay attention to in order to anticipate changes and the large demands on the teaching profession which are mainly emphasized on the mastery of science. Professional development can be defined as a long career process in which educators perfect their teaching to meet the needs of students (Maggioli, 2004).

As a result, teacher professional development has to be carried out repeatedly without any interruption as a step to stimulate, maintain, and improve teacher competence in solving educational and learning problems so as to meet student needs. It is in line with what Dasuki (2010) argues that the development of the teaching profession is also an absolute requirement for the progress of the nation in order to encourage the improvement of the quality of education.

Legal Basis for Teacher Professional Development

One form of the government's efforts to continue to develop the teaching profession as a strong and respected profession in line with other professions is by establishing the Regulation No. 14 of 2005 on Teachers and Lecturers which describes how the government tries to develop the teaching profession through legal protection with certain standards which are expected to encourage professional development of educators (Darmawan, 2020; Dasuki, 2010; Komara, 2016; Matnuh, 2017).

Legal protection is needed especially in a way that relates to society so that the civil effect of the teaching profession gets adequate recognition (Dasuki, 2010). This does not necessarily guarantee the development of the teaching profession individually, because in the individual context, the ability to develop oneself is the most important thing that needs to be done, and it can strengthen the teaching profession (Komara,

2016). Consequently, efforts to continue to empower them are a must so that the self-development abilities of teachers are increasing.

Dasuki (2010) clearly states that legal protection is important but self-development is more important and strategic in professional development efforts based on several reasons, among others, legal protection is important in creating basic conditions for strengthening the teaching profession, but it cannot make the substance of the professional development of educators automatic, legal protection can provide legal power to teachers, but it will be difficult to grow the teaching profession in carrying out the roles and duties in the field of education, and self-development can make the teaching profession aware and continue to empower itself in improving abilities related to its roles and duties in the field of education. Therefore, teachers must continue to strive to develop themselves so that in carrying out their roles and duties they can make a significant contribution in efforts to improve the quality of human resources for the benefit of developing an advanced and moral nation in accordance with the goals of national education.

The legal basis for the development of the teaching profession consists of various policies that have been ratified by law and by ministerial regulations. First, the Regulation Number 14 of 2005 concerning Teachers and Lecturers in article 5 paragraph 1 regarding the profession of teachers and lecturers as part of a special field of work requires the following professional principles that the teachers and lecturers:

(1) Have talents, interests, vocation and idealism,
(2) Have educational qualifications and educational background in accordance with their field of work,
(3) Have the necessary competencies in accordance with their field of work,
(4) Adhere to professional code of ethics,
(5) Have rights and obligations in carrying out their duties,
(6) Earn a determined income in accordance with his work performance,
(7) Have the opportunity to develop their profession in a sustainable manner, and
(8) Obtain legal protection in carrying out their professional duties, and
(9) Have a professional organization that is a legal entity.

Second, the Government Regulation Number 74 of 2008 concerning teachers in Articles 46, 47, and 49 regarding teacher professional development stipulates that

(a) Article 46 stating that teachers have the opportunity to develop and improve their academic qualifications and competencies, as well as obtain training and professional development in their fields,
(b) Article 47 paragraph 2 stating that teachers who have met the qualifications of undergraduate or Diploma IV graduates can develop and improve academic qualifications higher than those specified,
(c) Article 47 paragraph 5 stating that the government and/or local government shall provide a budget for the development and improvement of academic qualifications and competencies, and
(d) Article 49 stating that the development and improvement of the academic qualifications, competence, and professionalism of teachers by in-service teachers

as referred to in Articles 46 and 47 is carried out while continuing to carry out their duties.

Third, the Regulation of the Minister of National Education Number 16 of 2007 concerning standards of academic qualifications and teacher competence and the Government Regulation of the Republic of Indonesia Number 19 of 2005 concerning national education standards stipulate that each teacher has different academic qualifications for each education level and must master the four competencies that have been determined in order to improve teacher professionalism.

Fourth, according to the Regulation of the Republic of Indonesia Number 20 of 2003 concerning the National Education System regarding the development of the teaching profession as follows:

(a) The government and regional governments are obliged to foster and develop education personnel in educational units organized by the government and regional governments.
(b) Education providers by the community are obliged to foster and develop educational staff in the education units they organize.
(c) The government and regional governments are required to assist in the guidance and development of education personnel in formal education units organized by the community.
(d) Article 61 paragraph (3) states that competency certificates are given by the education providers and training institutions to students and community members as acknowledgement of competence to carry out certain jobs after passing a competency test held by an accredited educational unit or certification institution.

Finally, the Regulation of the Minister of National Education No. 18 of 2007 concerning certification for in-service teachers through portfolio assessment and the Regulation of the Minister of National Education No. 40 of 2007 concerning certification for in-service teachers through the educational pathway contain the regulations regarding the program for providing education certificates for teachers who have successfully completed their professional education. Teacher professional education is part of the process of developing and improving the quality of teachers which is still ongoing today. The provision of education certificates is a formal proof of teacher professional recognition given to teachers as professionals (Latiana, 2019).

In addition, Arifin quoted in Dasuki (2010) states that professional Indonesian teachers are required to have (1) a strong scientific basis as an embodiment of the technological society and the scientific community in the twenty-first century; (2) mastery of professional tips based on research and educational practices, namely education science as practical science is not just mere concepts; education is a process that occurs in the field and is scientific in nature, and educational research should be directed at the educational praxis of the Indonesian people; and (3) continuous professional development, the teaching profession is a profession that develops continuously and continuously between LPTKs and educational practice. The weakness in the teaching profession and education science is caused by the disconnection

of pre-service and in-service programs due to rigid bureaucratic considerations or weak education management.

Given these requirements for teacher professionalism, there is a need for a new paradigm to create a professional profile of Indonesian teachers in the twenty-first century, namely: (1) have a mature and developing personality; (2) strong mastery of science; (3) skills to awaken students to science and technology; and (4) continuous professional development. These four aspects are a unified whole that cannot be separated and coupled with other efforts that influence the development of the professional teaching profession (Dasuki, 2010).

Government Efforts to Improve Teacher Professionalism

The government has made efforts to improve the professionalism of teachers, including increasing the qualifications and requirements for higher education levels for teaching staff from school to university levels. The government has made efforts to improve teacher professionalism, including increasing the qualifications and requirements for higher education levels for teachers who do not yet have these qualifications or requirements. If they do not have the required qualifications, elementary school teachers must take the Diploma II equalization program (two-year program), junior high school teachers take the Diploma III education program (three-year program), and high school teachers take the undergraduate program (four-year program). However, these programs do not mean a lot if the teachers lack entropy of the power to make changes.

Another effort made by the government is the certification program. Teacher Professional Education (*Pendidikan Profesi Guru—PPG*) is a higher education after undergraduate education program that prepares students to have jobs with special skill requirements in becoming professional teachers. The *PPG* must be taken for one to two years after a candidate graduates from an undergraduate degree program in education or non-graduate education. The program started in 2005. The graduates of *PPG* will get a degree. Professional education will legitimize the teaching profession. Professional education will also add a *Gr* title after the teacher's name because according to the law, a teacher is a profession, just like a doctor. The aim of *PPG* produces teachers who have pedagogic, social, personal, and professional competencies and are able to develop competencies in a sustainable manner. The program takes 2 semesters or 1 year. It applies to those who want to become professional teachers, both undergraduates from education major and non-education major.

Apart from the *PPG*, to improve teacher professionalism, there are some activities for teachers to participate in such as *PKG—Pusat Kegiatan Guru* (Teacher Activity Center), *KKG—Kelompok Kerja Guru* (Teacher Working Group), and *MGMP—Musyawarah Guru Mata Pelajaran* (Subject Teacher Consultation) which allow teachers to share experiences in solving problems they face in their teaching activities (Darmawan, 2020; Dasuki, 2010).

Professionalization should be taken into account as a continuous process. In this process, pre-service education, in-service education including upgrading, coaching from professional organizations and workplaces, community appreciation for the teaching profession, enforcement of professional codes of ethics, certification, quality improvement of teacher candidates, rewards, etc., together determine one's professional development, including teachers. Thus, efforts to improve teacher professionalism are a shared responsibility between FTTE as the teacher producers, agencies that develop teachers (in this case the Ministry of National Education or private foundations), *PGRI*—Teachers Association of the Republic of Indonesia, and the community.

In conclusion, the development of the teaching profession is very important because teachers have an important role in the world of education. Several attempts have been made by the government to develop teacher professionalism. In addition, teacher professional development is based on various policies such as laws, ministerial regulations, and presidential regulations. This policy is a good step from the government to create professional teachers.

Teacher Professional Development Strategy

Teacher professional development is very important for every teacher especially in the era of digital technology where teachers are faced with a lot of challenges in teaching their students. They need the program to meet the current students' needs of skills and knowledge and to adapt themselves with the development of knowledge and technology to improve their teaching.

Teacher professional development must be designed so that effective results can be achieved. Mizell (2010) put forward three indicators that a teacher profession development program is successful. They are "(a) educators learn new knowledge and skills because of their participation; (b) educators use what they learn to improve teaching and leadership; and (c) student learning and achievement increase because educators use what they learned in professional development" (p.16). All of these indicators can be accessed through some instruments such as: surveys, tests, observations, video recordings, and interviews (Mizell, 2010).

Regarding the teacher professional development strategy in Indonesia, the government has supported the program by reforming the national education in Indonesia covering the national curriculum, 20% of the national budget provided for education, school operational assistance grant (BOS), and the smart Indonesia program. The increase of the national education budget has enabled the Department of Education and Culture, currently changed to Ministry of Education, Culture, Research and Technology, to apply strategies to improve teachers' professional development.

In order to improve teacher professionalism and competence, some policies have been made in Indonesia. There are two programs that have been organized by the

government. They are Teacher Professional Education (*PPG*) and Continuing Professional Development. By participating in the two programs, the in-service teachers will get opportunity to learn various competences they need to be professional teachers.

In 2017, the PPG program had been designed into two. They are pre-service PPG program (*PPG Pra Jabatan*) and in-service PPG program. They become a sole route for a teacher to earn a professional teacher credential. In these programs, teachers will participate in seminars and internships in a school to strengthen their pedagogical competency, topic understanding, communication skills, and character as professional educators.

In the Continuing Professional Development program, the majority of participants are certified teachers. They are encouraged to develop their abilities in understanding the abilities of pedagogy and subject area by enrolling in a 60-h PKB education and training program (Revina, 2019).

Unfortunately, the teacher professional development (TPD) program that has been run in the last four decades does not seem to be effective to develop teachers' competence. Teachers' academic knowledge and pedagogic skills continue to be poor. The level of learning among Indonesian students is still poor. Based on data provided by PISA (Programme for International Student Assessment) in 2018, Indonesian students reading literacy in 2018 was the same as it was in 2000. Indonesian children's arithmetic skills deteriorated between 2000 and 2014 (Beatty et al. 2018).

Innovative Teacher Professional Development

As previously stated, TPD program in Indonesia does not seem to be successful. One of the causes as stated by Ekawati and Kohar(2017) is that the program lacked follow-up activities where teachers may discuss the benefits and challenges of using a learning style, for example, in their classrooms. Revina (2019) also adds that the TPD program such as PKB or PPG is "simply a refreshment of the materials which teachers have previously obtained in college"; therefore, those programs are not effective in developing teachers' competence.

Reflecting on the unsuccessful TPD programs previously, innovative TPD programs must be developed and designed to create "opportunities for teachers to take control of their own learning, deepen their subject knowledge, construct knowledge from previous knowledge and experiences, and develop intellectual community with colleagues" (Ekawati & Kohar, 2017. Similarly, Loucks-Horsley et al. (1996) as cited in Ekawati and Kohar (2017) state that a good TPD program is:

> driven by a clear, well-defined image of effective classroom learning and teaching; provide teachers with opportunities to develop knowledge and skills and broaden their teaching approaches, so they can create better learning opportunities for students; and build or strengthen the learning community of science and mathematics teachers. (p. 3)

To achieve an effective TPD program, the program should consider teachers' needs as well as their abstraction levels on their roles and obligations as educators.

Therefore, the programs should be focussed on five domains. They are: "teachers as innovators; teachers as scientific developers to the community; teachers as network makers; teachers as educational designers; and teachers as entrepreneurs" (Imron, et al., 2020).

Professional Teachers in the Era of the Industrial Revolution 4.0: Challenges and Hopes

Education is an important aspect of life. Through education, human resources can be created and improved in quality. Quality resources are very vital in a country, including in the world of education. Formal and non-formal educational institutions are the key to the nation's civilization. Therefore, the teacher is one of the human resources engaged in education responsible for ensuring the quality of education.

A teacher as one of the elements in ensuring the quality of education must be a professional one. As a professional teacher, s/he must be able to carry out his/her duties and functions well. Professional teachers according to the PP No. 14 of *stipulates that teachers are professional educators whose main tasks include "educating, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education". In other words, the government has made various efforts to improve teacher professionalism.*

In improving the professionalism of teachers as educators, the government has launched various programs aiming to provide opportunities for teachers to develop and improve their quality. On the top of that, in 2020, the education budget allocation would reach Rp 508.1 trillion, or 20% of the 2020 state budget.

The allocation of this education budget is a very good opportunity for the world of education in Indonesia. With this amount of budget allocations for education, it is expected that education can develop teachers' capabilities and shape their character and civilization of a dignified nation in the intellectual life of the nation. Furthermore, teachers would have faith in God Almighty and noble character, are healthy, capable, creative, independent and responsible as well. A teacher is the heart of education; without the active role of teachers, reform policies on education will not produce optimal results.

The era of the Industrial Revolution 4.0 is one of the hot topics discussed by various groups today, including among the teachers. This era views information technology as the basis of human life. The rapid development of technology has a very fundamental impact on various aspects of human life. Digital technology provides various conveniences in innovating.

This amazing development of digital technology makes the movement and connectivity of humans and machines create a borderless world. This era is believed to shift activities that were originally carried out in the real world to the virtual world. This will affect many fields without exception in the field of education (Suwandi,

2018). This raises many challenges, especially for teachers in learning. Great hopes for universities, especially those that specialize in producing teachers so that their graduates are professional and can answer the challenges of the Industrial Revolution 4.0 intelligently.

Professional Teachers in the Industrial Revolution Era 4.0

Professional teachers are those who have 4 competencies, namely pedagogic, social, personality and professional competencies. Pedagogic competence is a skill that must be possessed by a teacher related to the characteristics of students which include physical, moral, social, cultural, emotional, and intellectual aspects. Social competence is related to the ability of teachers in terms of communication, working in groups, socializing, sympathizing, and having a sincere and pleasant spirit. Personality competence is related to attitudes that show good personality such as being wise, mature, authoritative, and having noble character to imitate. Professional competence is related to scientific mastery competence in accordance with their field (Alwi et al., 2018). This raises a further question of "How are professional teachers in the era of the Industrial Revolution 4.0?".

The era of the industrial revolution 4.0 makes information and technology so easy for anyone who needs it (Sukartono, 2018). Education has undergone tremendous changes. The task of the teacher who used to be a source of knowledge is slowly shifting and even that role will move away from him/her. In the era of the Industrial Revolution 4.0, the role and presence of teachers in the classroom will be increasingly challenging and require very high creativity so that learning is more meaningful (Pannen, 2018). Learning in the twenty-first century requires teachers to be able and have critical thinking skills, digital literacy knowledge and skills, information literacy, media literacy and mastering information and communication technology (Maya & Charles, 2015).In addition, the skills that must be possessed by students in the twenty-first century are life and career skills, learning and innovation skills, and information, media and technology skills (Trilling & Fadel, 2009; Saavedra & Opfer, 2012). Thus, a professional teacher should equip himself/herself with these skills so that students can answer the challenges of the twenty-first century.

Furthermore, the Indonesian Partnership for 21 Century Skill Standard (IP-21CSS) put forward the concept of twenty-first-century thinking in Indonesia (Sukartono, 2018). There are 5 conceptual frameworks for twenty-first-century skills, namely (1) creative thinking and innovation, (2) critical thinking and problem-solving, (3) communication and collaboration, (4) information, media and technology skills, and (5) life skills and career.

Creative thinking and innovation are related to aspects of how a teacher can think creatively, work creatively and implement new innovations in learning. Critical thinking and problem-solving skills are closely related to reasoning skills, good thinking systems, making judgments and decisions and being able to solve problems. Communication and collaboration is related to the aspect of communicating skills clearly and being able to collaborate with others. Information, media and technology skills have aspects of skills to access and evaluate information, use and organize information, analyse and produce media and apply technology effectively.

Life and career skills are of great significance in relation to character building and spiritual values. Character building has two aspects, namely showing scientific attitude behaviour (curiosity, honesty, thoroughness, openness and prudence) and showing acceptance of the moral values prevailing in society. While spiritual value is related to two aspects, i.e. living the concept of divinity through science and internalizing spiritual values in daily life. The complete framework of the twenty-first-century skills concept can be seen in Table 10.1.

In its application, the above skills can also be reflected in the use of language. There are several linguistic phenomena that are very interesting to assess whether we have lived up to the twenty-first-century skills above.

To answer the challenges of the Industrial Revolution 4.0, the Indonesian government has tried to improve the professionalism of teachers through formal education or training organized by the government and educational institutions, for example, *PPG—Pendidikan Profesi Guru* (Teacher Professional Education) attended by both in-service teachers and prospective teachers in the Pre-service PPG Program. Through this activity, teachers and prospective teachers are provided with various materials about learning activities, for example, approaches, methods, or learning models.

Various approaches, methods and learning models have been developed to realize the demands of twenty-first-century skills. Regulation of the Minister of Education and Culture Number 65 of 2013 has formulated that the inquiry learning model (Inquiry-Based Learning), the Discovery learning model, and the problem-based learning model have to be implemented in learning based on the 2013 curriculum stipulated by the Ministry of Education and Culture (Sufairoh, 2016). Thus, professional teachers must understand and apply the various learning models above because they are in accordance with the demands of the Industrial Revolution 4.0.

Table 10.1 Conceptual framework of twenty-first-century skills

Framework of twenty-first-*century skills*	*IP-21CSS*	*Aspects*
Creativity thinking and innovation	4 Cs	• Thinking creatively • Working creatively • Implementing innovation
Critical thinking and problem-solving		• Reasoning properly • Thinking in a good way • Giving judgments and decisions • Providing the right solution
Communication and collaboration		• Communicating effectively • Collaborating well in groups
Information, media and technology skills	ICTs	• Receiving and evaluating information • Managing and organizing information • Using media appropriately • Applying technology appropriately
Life and career skills	*Character building*	• Behaving with a scientific attitude (curiosity, honesty, thoroughness, openness and prudence) • Accepting the prevailing moral values in society
	Spiritual value	• Appreciating the concept of divinity through understanding science • Internalizing spiritual values in daily life

Challenges of the Industrial Revolution 4.0 Era

The challenges of the Industrial Revolution 4.0 era, particularly in the field of education, are related to the various skills that a professional teacher must possess. With the wide open accessibility of the open current flow of information and communication, the development of blended learning patterns is a must in responding to the challenges of the 4.0 Industrial Revolution era. Consequently, a teacher must have: (1) technological knowledge, (2) possess competence about the content of learning materials (content knowledge and (3) pedagogical knowledge).

Data literacy, technology and human skills are very needed. Data literacy is needed to improve skills in selecting and using an enormous amount of data. Technological literacy is needed to utilize digital technology to process data and information. And literacy related to humanity must be mastered to refine soft skills or individual characters so that they can work together in groups, be able to adapt, and be wise in this

information "flood" era (Iswan & Herwina, 2018: Winarso, 2018). This is a challenge that teachers inevitably have to face in the era of the Industrial Revolution 4.0.

Skills in applying various approaches, methods and learning models are needed. The inquiry learning model (Inquiry-Based Learning), the Discovery learning model (Discovery Learning, and the Problem-Based Learning model) are learning models that should be studied and implemented in learning (Maya & Charles 2015). These models can provide the skills to be possessed by students who have character in learning.

On the other hand, the toughest challenge is how to develop a character education model. However, the skills provided in schools to maximize skills and abilities must be balanced with character education to refine character. Character education is an attempt to balance cognitive skills with ethical values for students individually and as citizens (Zubaedi, 2011).Character is a psychological, moral or character trait that shows the identity of a person, both teachers and students.

Character education has three important components interrelated with each other, namely (1) knowing the good, desiring the good, and doing the good (Machsin, 2014). The three elements of character education complement each other. Character education not only teaches what is good and what is not, but more than that, character education tries to gradually and firmly establish habits. Students are accustomed to understand, feel, and do good. This will have a good impact on students in improving their behaviour to show good character.

Hope

In facing the Industrial Revolution 4.0 Era in the field of education, there are some very important hopes raised now and here. First, motivation alone is not enough for professional teachers but there must be a concrete form and a hard effort to create professional teachers in the era of the Industrial Revolution 4.0. Second, teachers must be faced with every innovation and technology transition. Therefore, teachers must be brave and ready to face it, otherwise we will be drowned by this era of disruption. Third, teachers must be creative and critical in facing this digitalization era, both in the learning process and to develop self-skills. Otherwise, the position of teachers as educators will be crushed by the skills possessed by students because they are faster in the world of digitalization.

In learning, it is hoped that a teacher can use various approaches, methods and appropriate learning models. This is in accordance with the demands of the 2013 Revised Curriculum that has been proclaimed by the government through the government regulations. In addition, the greatest hope for teachers is to provide character education appropriately so that they can balance between skills and good character. Thus, professional teachers are teachers who can "hold the world through cyber" but do not abandon character education so that students are intellectually intelligent, emotionally intelligent, and spiritually intelligent. Hopefully future teachers can make this wish come true.

Professional teachers in the 4.0 revolution era have many challenges in the learning process. These challenges must be faced by teachers by improving their skills and being willing to work hard to realize learning expectations in the era of the Industrial Revolution 4.0. Every educational institution will of course also strive to create professional graduates to answer the challenges of the Industrial Revolution 4.0.

Government Efforts to Improve Teacher Professionalism

Through education, human resources can be created and improved in quality. Quality resources are very vital in a country, including in the world of education. Formal and non-formal educational institutions are the key to the nation's civilization. Therefore, the teacher is one of the human resources engaged in education who is responsible for ensuring the quality of education.

It is no doubt that education is a very valuable future investment. The government has committed that education for future generations must be initiated and prepared in earnest. For this reason, the process of seeding future generations must be accompanied by the preparation of professional teachers through a quality and accountable teacher education system.

Teachers as an element in ensuring the quality of education must be professional teachers. As a professional teacher, he must be able to carry out his duties and functions well. Professional teachers according to *PP* No. 14 of 2005, teachers are professional educators with the main task of educating, guiding, directing, training, assessing, and evaluating students in early childhood education through formal education, basic education, and secondary education". This Regulation stipulates that teaching is a profession. For this reason, the government provides some efforts to improve teacher professionalism through Teacher Professional Education Program (PPG).

PPG—Pendidikan Profesi Guru (Teacher Professional Education)

The certification program is one of the government's efforts to improve teacher competence in Indonesia. One of the indicators that someone has been declared worthy and passed the competency test to become a professional teacher is education certification. For vocational teachers, a certificate of competency expertise is an indicator that the vocational teacher is an expert in the vocational field.

With an education certificate, teachers are prepared to face challenges in the 4.0 era. To be able to compete in the era of the industrial revolution 4.0, innovation is needed so that prospective professional teachers are exposed to information technology from an early age and use technology in the learning process. The Ministry

of Research, Technology and Higher Education continues to increase the number of vocational or vocational teachers through the PPG program.

The PPG program launched by the government is in accordance with Regulation of the Minister of Research, Technology and Higher Education Number 55 of 2017 concerning Teacher Education Standards. "The pre-service *PPG* program is intended for graduates who have various backgrounds, namely graduates of undergraduates in education or non-education or Diploma 4 (who have not/not served as school teachers). Meanwhile, *PPG* is intended for teachers who have taught to improve their ability to be professional in teaching in accordance with the Regulation of the Minister of Education of the Republic of Indonesia Number 37 of 2017 concerning Certification of Teachers in Appointed Positions until the end of 2015.

The PPG program is designed systematically by applying quality principles starting from the selection, learning process and assessment. The competency test is expected to be able to produce professional teachers. To accelerate this program, *PPG* is implemented in two forms, namely subsidized *PPG* and self-financing *PPG*. Subsidized *PPG* is the implementation of *PPG* financed by the government. While the self-financing *PPG* is fully borne by students.

The *PPG* program is expected to produce professional teachers according to the development of the industrial revolution 4.0. Because the professionalism of teachers in Indonesia must be able to answer the challenges of advances in science and technology that have an impact on changes in learning patterns and increase student creativity in learning.

The preparation of teachers as a profession is stipulated in the Government Regulation No. 74 of 2008 concerning Teachers. In addition to a teacher must have an undergraduate qualification, that teacher must have a professional teaching certificate obtained through professional education or *PPG*. The Government Regulation No. 74 of 2008 Article 2 states that teachers are required to have academic qualifications, competencies, educator certificates, physically and mentally healthy, and have the ability to realize national education goals.

Furthermore, Article 4 paragraph (1) states that Educator Certificates for teachers are obtained through professional education programs organized by universities that have accredited education personnel procurement programs, both organized by the government and the Community, and determined by the government. In paragraph (2) it is stated that the professional education program as referred to in paragraph (1) is only attended by students who already have the Academic Qualifications of undergraduate or Diploma IV in accordance with the provisions of the legislation.

The *PPG* is expected to be able to answer various educational problems, such as: (1) shortage of teachers, especially in the outermost, leading, and underdeveloped areas, (2) unbalanced distribution, (3) qualifications under standards, (4) teachers who are less competent, and (5) mismatched educational qualifications with the field being taught. Besides, the *PPG* can produce professional teachers and graduates who are excellent and ready to face the demands of the times.

Research Development: Method and Procedure

Stages: Preliminary Study–Development Phase–Model Validation–Effectiveness Test

The type of research mostly carried out by undergraduate students (as prospective teachers of junior and high schools or equivalent) and by postgraduate students, most of whom work as teachers, is development research, namely the development of teaching and learning textbooks, learning modules, media (electronic and non-electronic), and student worksheets. According to Gall (2007) p. 256, research and development

> … is an industry based development model in which in the finding of research are used to design new products and procedures, which then are systematically filed-tested, evaluated, and refined until it meets the specified criteria of effectiveness, quality, or similar standard.

Regarding the learning materials, Tomlinson (2011:66) points out that

> Materials include anything which can be used to facilitate the learning, they can be presented in print, through live performance or display, or on cassette, CDI-ROM, DVD. or the internet.

It is quite obvious that teaching and learning materials must be designed and written in such a way in accordance with the instructional rules because it will be used by teachers to assist and support the learning process of their learners. In addition, teaching materials are a set of learning tools that contain learning materials, methods, limitations, and ways of evaluating which are designed systematically and attractively in order to achieve the expected goals, namely achieving competence with all its complexity (Widodo & Jasmadi, 2008).

In general, there are three main stages carried out in development research, namely: preparation/problem determination/needs analysis, development, and assessment.

In detail, Gall (2007) states that there are ten steps to carry out, namely: (1) research and information collecting, (2) planning, (3) develop preliminary form of product, (4) preliminary field testing, (5) main product revision, (6) main field testing, (7) operational product revision, (8) operational field testing, (9) final product revision, and (10) dissemination and implementation. Jolly and Bolitho in Tomlinson suggest that there are 7 steps that can be taken, namely: (1) identification of need for material, (2) exploration of need, (3) contextual realisation of materials, (4) pedagogical realization of materials, 5) production of materials, (6) student use of materials, and (7) evaluation of materials against agreed objectives. Alessi and Trollip (2001) claim there are three stages, that is Planning, design, dan development, on the whole, there are 18 steps. Tessmer (1993) put forward 5 stages in formative evaluation which include (1) self-evaluation, (2) expert review/expert validation, (3) one-to-one evaluation, (4) small group evaluation, dan (5) field test/experiment research. It is in line with Dick et al. (2005) stating that the three types of formative evaluation are

referred to as one-to-one evaluation, small group evaluation, and field trial evaluation". Specifically, various experts offer their various and dynamic stages to carry out development research. Gall (2007) offers ten steps as follows:

(1) research and information collecting;
(2) planning,
(3) developing preliminary form of product,
(4) preliminary field testing,
(5) main product revision,
(6) main field testing,
(7) operational product revision,
(8) operational field testing,
(9) final product revision, and
(10) dissemination and implementation.

Jolly and Bolitho in Tomlinson (2011) suggest that there are 7 steps that can be taken, namely:

(1) identification of need for materials,
(2) exploration of need,
(3) contextual realization of materials,
(4) pedagogical realization of materials,
(5) production of materials.
(6) student use of materials, and
(7) evaluation of materials against agreed objectives.

Alessi and Trollip (2001) state that there are three stages, that is planning, design, and development.

In assessing the teaching and learning materials, Tessmer (1993) suggests 5 stages including: (1) self-evaluation, (2) expert review/expert validation, (3) one-to-one evaluation, (4) small group evaluation, and 5) field test/experiment research. This stage is similar to what Dick et al. (2005) referring to the three types of formative evaluation: "one-to-one evaluation, small group evaluation, and field trial evaluation".

During the academic year of 2020/2021, many students of undergraduate and graduate (master degree) students of Indonesian Language Study Program of Indonesian Language and Literature Education Department, Faculty of Teacher Training and Education (FTTE) of Universitas Sriwijaya (Unsri)undertook their thesis research on development. Before taking thesis examination, it is compulsory for the students to publish an article relating to their theses (undergraduate and master degree levels) in any relevant journals of education. The following are some examples of the results of research on the development of teaching materials that have been carried out in 2020 and reported by the master degree students of Language Education Study Program, FTTE Unsri, Umiyatun, Development of Student Worksheets in Writing Moodle-Based Scientific Articles in Grade XI of SMA Negeri 1 Parittiga, West Bangka. This development research aimed to:

- produce worksheets based on the Moodle application. It described the results of the needs analysis on the development of Moodle-based scientific article writing worksheets;
- produce a prototype of Moodle-based scientific article writing worksheets in accordance with the results of the needs analysis;
- describe the results of the Student Worksheets alpha test for writing Moodle-based scientific articles;
- describe the results of the Student Worksheets beta test for writing Moodle-based scientific articles; and
- describe the results of product validation using Moodle-based scientific article writing.

The study adopted the three stages of research and development model by Allesi and Trollip (2001) as follows (Fig. 10.1).

And then the three stages were broken down into 14 steps as follows:

Planning:

(1) Determining the Field/Scope of Research Study
(2) Identifying Student Characteristics
(3) Determining and Gathering Resources
(4) Doing Brainstorming

Design

(1) Analysing Concepts and Tasks
(2) Preparing the Prototype
(3) Designing Flowcharts and Storyboards

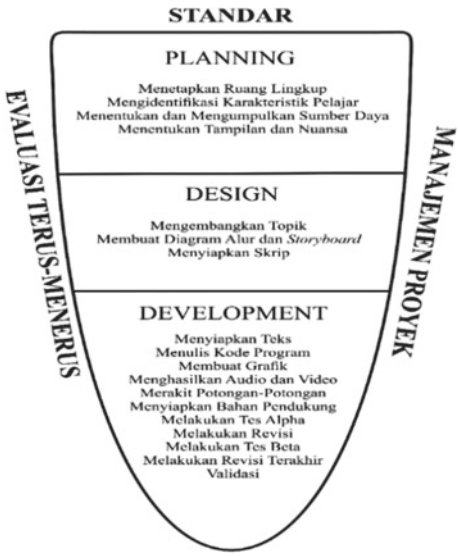

Fig. 10.1 Stages of development model (adopted from Alessi and Trollip Theory)

Development

(a) Combining the parts
(b) Preparing Supporting materials
(c) Carrying out Alpha Test
(d) do Revision
(e) Carrying out Beta Test
(f) Revising Final Results Hasil
(g) Validating Products (Summative Evaluation

The research was conducted at SMA Negeri 1 Parittiga, West Bangka Regency, Kep. Bangka Belitung Islands from 24 February to 30 April 2020. The research subjects consisted of 35 students of Grade XI IPA1 (Science Major). The development procedure consisted of three stages, namely the planning, design, and development stages. The planning stage includes activities to determine the field/scope of research studies, identify student characteristics, determine and collect sources, and conduct brainstorming activities. The design phase included activities to analyse concepts and tasks, develop prototypes, and design flowcharts and storyboards. At the development stage, the activities included combining and integrating parts, preparing supporting materials, carrying out alpha tests, conducting revisions, conducting beta tests, conducting final revisions, and conducting product validation (summative evaluation).

The data were obtained from the questionnaires, interviews, and tests. The questionnaire data were derived from needs analysis, alpha tests, and beta tests. The interview data were obtained from the brainstorming activities with the research subjects, Indonesian language teachers of SMA Negeri 1 Parittiga, and members of the Indonesian Language MGMP (*Musyawarah Guru Mata Pelajaran*-Subject Teacher Conference) of West Bangka District. The test data were obtained from the initial test and final test in the learning process.

The study showed that: (1) based on the results of the needs analysis, it was necessary to develop technology-based supporting teaching materials such as Moodle-based Worksheets to support scientific article writing learning activities, (2) Moodle-based Worksheet prototype consisted of two parts: the introduction and worksheets. The arranged Worksheets consisted of four types that were adapted to the basic competencies that need to be mastered by Grade XI SMA students; (3) the assessment at the alpha test stage showed that the product was feasible and categorized as very good with an average score of 4.36 for material experts and 4.55 for media experts; (4) the assessment at the beta test stage showed that the student's response to the product was quite good with an average value of 3.89; and (5) the product validation stage (summative evaluation) shows that the product was quite effective in improving student learning outcomes based on an N-gain score of 0.49 in the medium category. The following is an example of the resulting worksheet (Fig. 10.2).

The worksheet consisted of four types according to the basic competencies that need to be mastered by the students. In each worksheet there was a summary of the material, presentation of examples, discussions, group assignments, and independent assignments. Worksheet 1 described identifying the information, purpose,

Fig. 10.2 Example of the resulting worksheet

and essence of a scientific article that is read. The features used in this worksheet included summary material, examples, discussions, group assignments, and independent assignments. Worksheet 2 explained the designing information, objectives, and critical importance to be presented in scientific articles. This worksheet contained material summary features, examples, database, and independent assignments. Worksheet 3 described the systematic and linguistic analysis of scientific articles. In this worksheet, there are features of material summaries, examples, discussions, group assignments, and independent assignments. Worksheet 4 described the construction of a scientific article by paying attention to content, systematics, and language. This worksheet had material summary features, examples, workshops, and independent assignments. In addition, in each task feature there are work instructions, questions, and an assessment rubric.

Classroom Action Research to Improve Teacher Competence

Technological advances and the development of today's world require teachers to be able to adapt to change and have various skills such as critical thinking, creative, collaborative, communicative, and so on. *PPG* is expected to be able to improve the quality of prospective teachers and be ready to implement the principles of Independent Learning in carrying out their duties. The implementation of the *PPG* Program is expected to produce graduate teacher candidates who are able to prepare students to face increasingly complex challenges in the twenty-first century and make a positive contribution to realizing sustainable development goals.

In an effort to improve the competence of teachers, especially those who participate in *PPG*, each of these teachers must conduct a classroom action research in their respective classes and report it in the form of a final report. It is contained in the

PPG Implementation Guidelines (2017 that one of the objectives of implementing the Field Teaching Practice is "Students have the ability to plan classroom action research (CAR) activities". Previously, in the definition section, point (2) was also stated, "The intended learning tool review is an activity to review learning tools and learning practice videos that have been made by students at the development stage of previous learning tools, new peer teaching models, CAR, reflection, and RTL". In the Lecturer and Teacher Tutor activities section, it is also stated that there are: (1) explanations of techniques for preparing CAR proposals and their implementation in schools, (2) providing input in the preparation of CAR plans, (3) monitoring the preparation of CAR proposals, and (4) online discussions with students need assistance in preparing the CAR proposal.

In the Introduction section, Field Experience Practice (*PPL—Praktek Pengalaman Lapangan*) is one of the courses in the *PPG* Program which contains teaching and non-teaching training activities, including conducting CAR exercises, which are carried out in a guided and integrated manner to meet the requirements for the formation of professional teachers. *PPL* is held so that *PPG* participants have real and contextual experience in applying a set of knowledge, attitudes, and skills that can support the achievement of the full competence of professional teachers. In the COVID-19 Pandemic Era, *PPL* is carried out online, where preparation, implementation, guidance/monitoring, and reporting are carried out online. The objectives are: a) Improve students' ability to prepare for the implementation of offline and/or online learning and CAR, b) Improve students' ability to apply learning tools and CAR that have been designed, both offline and/or online, and c) Improve students' ability to prepare the implementation of feasible non-learning activities is carried out offline and/or online.

The PPG participants in 2020 conducted a CAR entitled "Improving the Ability to Identify the Values and Main Contents of the Story with the Mind Mapping Method for Grade X Students of Adhyaksa 1 Senior High School of Jambi". The formulation of the problem was whether or not the mind mapping method improve the ability of Grade X students of Senior High School Adhyaksa 1 of Jambi in identifying the values and contents of saga texts.

As we know, mind mapping is a method to maximize the potential of the human mind by using the right brain and left brain simultaneously. This method was first introduced in 1974 by Tony Buzan, a British human potential development expert. Mind mapping can also be interpreted as a process of mapping the mind to connect the concepts of certain problems from nerve cell branches to form a correlation of concepts towards an understanding and the results are poured directly on paper with animations that are liked and easy to understand by the maker. Thus, the resulting writing is a direct description of how the connections in the brain work. Figures 10.3 and 10.4 illustrate a Mind Map (Buzan, 2012).

The CAR was carried out online using WhatsApp class groups and zoom meetings with the students. The data collection techniques used tests and non-tests. The test instrument was in the form of questions that were done by the students in the initial, while, and final activities of the teaching and learning process in the classroom. The non-test instruments were in the form of observations made in its implementation.

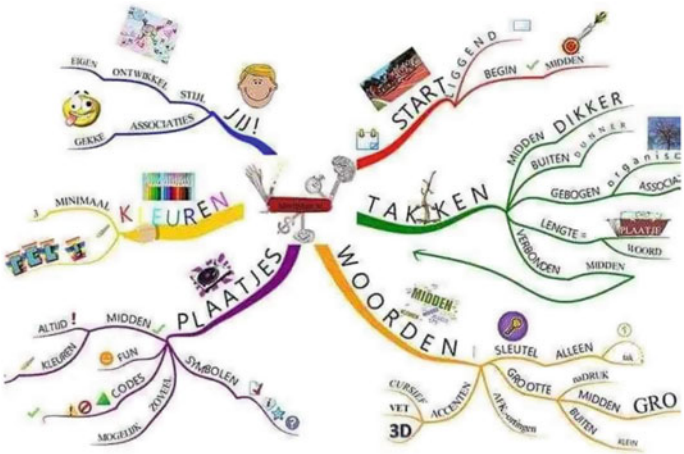

Fig. 10.3 Examples of mind mapping (adopted from Buzan, 2012)

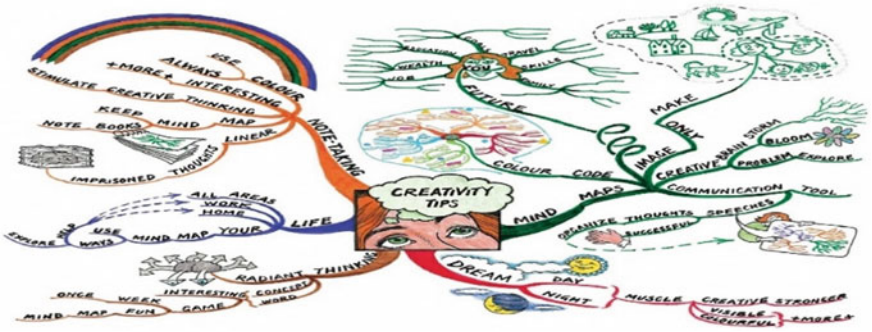

Fig. 10.4 Examples of mind mapping (adopted from Buzan, 2012)

To determine the end of the nth cycle, the criteria for the success of the action were set. The action was declared successful if 70% of the students got an average score of at least 70 in the final test. The mean formula = total student scores/number of students. The minimum attitude value had to be Good (B).

In Cycle 1, the average student learning outcomes and the percentage of completeness increased compared to the results obtained in the test before being subjected to action (pre-action), but still did not reach the passing grade because it was still below 70 and on the average most of the students did not reach 75% of the passing grade. Therefore, the study was continued to the second cycle based on the learning outcomes of Cycle 1. The average student learning outcomes and the percentage of the passing grade in cycle 2 increased compared to those obtained in Cycle 1. Yet, students still needed strengthening in order to have more maximal result. Consequently, the study was continued to the third Cycle. The results of the 3rd cycle

treatment showed an increase in the scores obtained by the students. The average score increased was 6.6, and the average score of Cycle 1 = 66.6, Cycle 2 = 80, and Cycle 3 = 86.6.

Obviously, classroom action research (CAR) conducted by teachers has its own characteristics. It is not to test a hypothesis, as is usually the case with formal research conducted by individuals or institutions. It is a step or a series of processes carried out by the teacher in and during learning. This process is carried out independently where the teacher acts as an internal researcher. The implementation never ends. It is sustainable and forms an iterative cycle of activities.

The teacher realizes that something is wrong and blocks the learning process. A teacher might have these questions in his/her head "What's not right? What's bothering me?" and perhaps other similar questions. These problems are recorded and scheduled by the teachers as a record of the learning problems they run into. The records must be analysed and problem-solving actions must be planned. For example, students' daily test results are very low. The teacher reflects on the flashback of the learning process that has been carried out.

It was noted that students were less enthusiastic about learning. Are they caused by their lack of enthusiasm, inappropriate strategies and methods, or not using media and props.

The teacher plans alternative actions to solve the problems that are considered most crucial. The goal to be achieved by the teacher in doing CAR is to improve the quality of the learning process and results. Unsatisfactory learning outcomes are an indication of a learning process that is having problems. In fact, there is not a single teacher who does not experience obstacles and problems in teaching.

By carrying out CAR activities, several benefits will be obtained for teachers, including:

(1) Written reports on CAR activities can be used as physical evidence that the teacher has written scientific papers. This scientific work can be used by teachers for various purposes such as promotions/classes, participating in outstanding teacher competitions, teacher creativity competitions, and so on.
(2) Teachers are accustomed to carrying out research independently to solve the learning problems they are carrying out. In turn, the teacher will become a reliable learning problem solver so that he deserves the title of a professional teacher.
(3) Can improve the quality of the process and learning outcomes. Usually, a quality process will lead teachers to quality results as well.

Conclusion

The teacher's job in the twenty-first century is a complex and uneasy one along with large and rapid changes in the school environment driven by advances in science and technology, demographic changes, globalization and the environment. Professional teachers are no longer just those who are able to teach well, but those who are

able to become learners and agents of school change, and are also able to establish and develop relationships to improve the quality of learning in their schools. For this reason, teachers need effective professional development such as having competence in mastering the substance of the field of study and scientific methodology, the structure and material of the curriculum in the field of study, and utilizing information and communication technology in learning, organizing curriculum materials in the field of study, and improving the quality of learning through classroom action research.

The challenge of twenty-first-century teacher competence leads the professional teachers to adapt themselves to understand their disciplines from various contexts, as well as being sensitive to the development needs of students and society. The most important thing is that teachers have to race to keep up with the demands of development, not only get involved but act innovatively. A teacher has to be able to formulate, construct, compile, modify and be sensitive to information so that it can be understood as knowledge. The development of ICT brings changes in all lines of life due to the fact that our twenty-first-century learners live in a digital environment full of information flow.

Many countries are reforming educational goals and practices owing to the influence of ICT developments and various forms of educational innovation. The greatest hope of educational innovation is the support and integration of ICT in the learning process, thereby enhancing the quality of the learner's learning experience. Teachers must be actively involved in pedagogical innovation. Teachers not only have a major role in implementing educational reform, but also must be involved in formulating the concept and design of the necessary educational reforms. Herein lies the importance of teachers to also act academically. At the practical level, in carrying out the main task of facilitating learning, every teacher should act based on pedagogical decisions in accordance with the latest learning and learning theories, as well as developmental theories.

The government's efforts to continue to develop the teaching profession as a strong and respected profession in line with other professions can be seen from the issuance of *PP* No. 14 of 2005 seeking to develop the teaching profession through legal protection. The government has made some efforts to improve the professionalism of teachers, including increasing the qualifications and requirements for higher education levels for teaching staff from the secondary level to tertiary institutions. The Diploma II equalization program for elementary school teachers, Diploma III for junior high school teachers and undergraduate for senior high school teachers. Other efforts made are the certification program and the establishment of the *PKG* (Teacher Activity Center and *KKG* (Teacher Working Group). In addition, a teacher who got an educator certification is given a monthly allowance.

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