Indonesia Teacher Competencies in Integrating ICT Technology for Education

This study is focusing to identify teacher competencies and readiness in implementing technology for teaching activities and their attitude towards. Indonesian teachers were included as a sample of study which selected through random sampling technique. The questionnaire and interview script were adapted the component of ICT CFT that released by UNESCO as indicator, which is consists of several aspects, that is: (1) Understanding ICT for education policies aspect; (2) Curriculum & Assessment aspect; (3) Pedagogical aspect; (4) Digital skills aspect; (5) Administration aspect; and (6) Teacher development aspect. The result shows positive trends that most of Indonesian teachers possess according to ICT competencies attribute aspect such as employed ICT into recent curriculum and assessment; pedagogical aspect; technological knowledge & skill; administration use; and teacher professional development aspect. However, teachers are still lack for idea contribution and innovation towards ICT development for learning. The result about teacher attitude toward ICT result shows positive feedback, but still lack of ICT technology access and training. In conclusion, Indonesian teacher have possessed by high standard of ICT competencies but lack of supporting systems such accessing into ICT facilities.

Keyword: ICT for Education; ICT Competencies; Technological Literate; Teacher Readiness; Teacher Competencies

Introduction

Nowadays, the present of technology giving a major transform on the educational system. This transformation is shown by the change of method on serving the knowledge in classroom, started first from teacher is acting like a musical conductor for teacher centered then changing into student-centered learning. According to Sumintono et al., (2012), the use of technology for education is transforming the teachers' role as knowledge distributor into learning facilitator.

Since the constructivism theories dominate the educational view, many constructivist scholars believe that the learning through technology could provide meaningful learning by presenting authentic context. Moreover, the implementation of technology has potential to support effective communication between students and teacher. This communication is effectively melting rigid relationship between teacher and students, which can beneficially for students in ease to access information from the expert and to enrich the knowledge by improving learning experiences (King & South, 2017; Vitanova et al., 2015). Majority people believes that technological used for education is started in the last century. However, the implementation of technology for teaching and learning had been started since 2000 years ago. Basically, the present of technology is enhancing human learning especially in
answering the fundamental reason why/how is human learns. In our today educational system, the branch of education that implementing integrating technology is well known as Educational Technology. Generally, educational technology was defined as the tools that assist the process of information and knowledge transfer (Huang et al., 2019). This general definition is often misunderstanding by our society which set technology as a teaching tools rather than supporting tools for learning. According to Jhurree (2005), the present of technology should not be replaced teacher role. Technology should be transforming into supporting tools to achieve learning goals and improving the quality & efficiency of educational systems.

Besides shifting our educational system, the presence of technology is also affected towards teachers' performance. As an important part of 21st education, the teachers have to possess sense of creativity in constructing innovative learning by integrating ICT technology media into the learning activities (Herliani & Wahyudin, 2018). Ahmad et al. (2016) mentioned that well preparedness teacher will created technology facility as a promising platform to enhance effective and efficient teaching and learning activity. This statement is empowering teacher to be technological literate, in which teacher have an ability to engage technology as the media for integrating, accessing, communicating, creating, and evaluating information in the learning process through high order thinking.

Technological literacy is an important qualification for teacher. Moreover, it is becoming the part of teacher pedagogical competencies as mentioned by Indonesian MOE Regulation about standard qualification and competencies for teacher (No.16 of 2007) which state “the application of information and communication technologies are important for teacher in learning activities”. This regulation is demanding teachers in utilizing ICT to create effective teaching and learning environment (Syahid et al., 2019). The demanding on competencies for teacher is also seen as global needs. United Nations Educational and Organization released 6 main aspects which promote several activities to develop teacher competencies, included: (1) Understanding ICT for education policies aspect; (2) Curriculum & Assessment aspect; (3) Pedagogical aspect; (4) Digital skills aspect; (5) Administration aspect: and (6) Teacher development aspect. The importance of ICT competencies is also mentioned as the crucial competencies for creating an ICT-based classroom management. The teacher who has better ICT competencies is important for their performance and students’ learning achievement activities (Syahid et al., 2019). According to Takwin et al. (2018) a professional teacher is supposed to master specific competencies in ensuring appropriate learning content presented to the learner. In the International Symposium on Open, Distance, and E-Learning 2018, the Head of ICT Centre for Education of Indonesian Ministry of Education stated that only 40% of Indonesia teacher has readiness and competencies for technology implementation for learning purpose.

There are several strategies and efforts to improve ICT competencies of teacher including proper teacher training, access to the ICT hardware for teacher (Mahdum et al., 2019; Vitanova et al., 2015), and establish regulation
for standardize qualification and competencies for teacher. In fact, the reality shows ICT implementation for education faced several obstacles which could affect to the teacher ICT competencies (Nurhabibah et al., 2018). As a Hermawan et al. (2018) mentioned several obstacles to implement ICT in teaching and learning process such as lack of policy, changing curriculum, gaps of teacher quality, gaps of education quality, lack of infrastructure, lack of planning, and lack of skilled workers. Previously, Son et al. (2011) was conducted study which focusing on computer literacy of Indonesian English teacher in 2011. The study result shows several obstacles such as facilities, time consuming, internet access, individual skills and readiness during implementation of ICT media for educational purposes. In conclusion, these recent study is conducted to response today questions about Indonesian teachers’ competencies in using ICT media for teaching and learning purposes.

Methodology

The sample of study is including 300 teachers from Elementary schools, Junior High School, and Senior High School. Moreover, the sample is also involved teacher who teach in government and private school. The simple random sampling technique was used to select participant or object of study in which the subject of study has equal probability of being chosen as a sample. The data is collected by using questionnaire form and interview. The content of questionnaire is construct based on the Indonesian MOE regulation. The questionnaire is administered in online form using Google form, while the interview form is conducted through telephone line.

Results and Discussion

Instrument Validity and Reliability

Maintaining the quality of item in assessing the teacher competencies is important in accurately measuring teacher competencies in using technology in educational purposes. The instrument validity analysis involved an expert validator in educational technology, instructional media development, and lecturer in University. The Index of Item Objectives Congruence (IOC) is used as model to assess instrument validity. The result of validity checking shows 25 items proposed are accepted to use as item for self-assessment questionnaire. On the other hand, measuring reliability of instrument through the implementation of internal consistency approach, which is tested based on single test administration (Gog et al., 2007). These reliability test result shows the alpha value is 0.93. According to Tavakol & Dennick (2011), the acceptable value of alpha is > 0.70, means the analysis of alpha values is accepted (0.93 > 0.70).
Teacher ICT Competencies Analysis

The questionnaire items are constructed by using six aspects based on ICT CFT that released by UNESCO including: (1) Understanding ICT for education policies aspect; (2) Curriculum & Assessment aspect; (3) Pedagogical aspect; (4) Digital skills aspect; (5) Administration aspect; and (6) Professional development aspect.

ICT Knowledge and understanding towards Education Policies

The first aspect is emphasizing on how teacher have understanding towards the national education policies for ICT. Moreover, teacher must be able to design, modify, and apply these national policies for learning purposes. Additionally, the first aspect is also emphasizing teachers’ roles in giving critiques and suggestion towards national policies. The establishment of national education policies is according to the national priority in all sector of education (UNESCO, 2013). The present of policies is also managing the regulation and society behavior on implementing effective and efficiency system for education. According to Bottino (2003), the proper educational policies for ICT must emphasize on it roles as a demand pull, that driven based on user needs and pedagogical understanding. The demand pull approaches is implementing by several countries including Indonesia by promoting teacher main competencies (MOE decree for teacher standard qualification and competencies No.16 of 2007).

Through the depth understanding educational policies and the role of ICT for education can lead teachers to optimize the utilization of technology for learning purpose. This recent study shows the majority of teacher is design their ICT instructional media occasionally (Table 1). They argued that preparing and creating proper instructional media using ICT media takes more time. The others also state the lack of information and knowledge in using ICT media is becoming main barrier for teachers in developing their own instructional ICT media. However, Tamrin et al. (2017) mentioned that reason is not becoming an excuse for teacher to create proper learning media. He also stated that preparing and planning teaching material and instructional media is supposed to be responsibility for teacher.

Table 1. Aspect of understanding ICT in education policies

<table>
<thead>
<tr>
<th>Item</th>
<th>Result in percentage</th>
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<tbody>
<tr>
<td>I design and create my own ICT media for learning purposes.</td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td>5.3%</td>
</tr>
<tr>
<td>I participate in workshops, training, &amp; conferences as an effort to develop a national ICT program.</td>
<td>28%</td>
</tr>
<tr>
<td>I contribute the ideas</td>
<td>51.7%</td>
</tr>
</tbody>
</table>
Teacher knowledge about ICT role in educational policies will also give an advantage for them to contribute their perspective in form of suggestion and criticize for the improvement of using ICT media for educational purposes. The event such as workshop, training, and conferences are known as the most effective way in improving specific prowess and program. As Ravn & Elsborg (2011) mentioned conferences are a source of knowledge, idea, and inspiration. The lack of participation in event such training, workshop, and conferences can be affected to the development of teacher content knowledge, teaching skills, and practices (Darling-Hammond & McLaughlin, 2011). This study result (Table 1) shows teachers have low interest in attending the conferences, workshop, and training. Majority of teacher reasoned that the overload of schools activity made them difficult to joined self-development event and activity. Since the implementation of full day schools, the middle and high schools teacher work time are increasing. Full-day School program is based on the concepts of integrated activity and curriculum, means all students activities in school are packed in an educational system (including playing, eating, etc) (Benawa et al., 2018). Practically, teachers must attend the schools from 7.00 until 16.00. Additionally, the lack of information and access to the self-development is also becoming major issues, especially for remote area teacher. The other way to contribute the development of policies is conducting, writing, and publish research article. Strengthen the claim, Harris (2015) states that research can be impactful to the policies development as long as the result of conducted research can give feedback that shape policies and adopted into practice. The research is also giving alternative perspective that teachers can perform in solving educational problems. In fact, this study result shows teacher intensity in contributing for scientific article is still low. They argued that overload activity in schools is becoming the obstacle to conduct and writing a research article. In conclusion, all these problems might be experienced by many teachers, but their professionalism is determined based on their effort to keep growing as the Indonesian MOE Regulation (No.16 years 2007) mentioned about professional development by conducting research activity.

Curriculum and assessment

The aspect of curriculum and assessment is emphasizing on teachers excellent knowledge regarding curriculum standard, assessment strategies, and student characteristic which is aiming to create complex problem for learning in measuring students understanding. Moreover, the teacher must be able to integrate the use of ICT into the curriculum. Curriculum knowledge is known as an important element of teachers’ pedagogical. According to Behar et al. (1994), curriculum knowledge is defined as the teachers’ ability to apply theoretical principles and behaviors which are refer to the several processes
including: planning, implementing, and evaluating. Quoting the Shulman and Sykes statement, Ariav (1991) simplify the definition of curriculum knowledge as the understanding of the curriculum form and the ways of the curricula are implemented in text and material. According to this definition, it clearly defines that curriculum is covering the educational context holistically. Means is not only in the textual context but also curriculum should induced into the material of teaching and learning. As we know the teaching and learning materials are referred on the sources use to deliver learning including the material sources and instructional media. Discussing about curriculum knowledge of teachers, this study is attempted to see the concern of teacher towards curriculum implementation toward their instructional material. The result (Table 2) shows mostly teacher is constructed their ICT media based on the national curriculum. Teachers mentioned that through the optimization of national curriculum into their instructional material and media (ICT media), they can facilitate learner to fulfill basic competencies.

Essentially, instructional media is facilitating the delivery of learning and built the communication between teachers and learner. Moreover, instructional media is also a component that interconnected with other component of learning to create expected learning environment (Widodo & Wahyudin, 2018). Consideration to the classroom condition and students characteristics is also becoming standard in selecting instructional media. These characteristic of learner is including ages, cognitive level, and socioeconomic. Proper instructional media can help the instructor to provide high quality teaching and learning process, and affected to the learner learning outcome to be more leverage. Moreover, it is also increased learner interest and motivation during learning process (Saravanakumar, 2018). According to this study result (Table 2), majority of teachers are often selected the ICT devices in the learning process based on the classroom condition and student characteristic. Teacher believes using proper instructional media is effectively facilitating the delivery of learning materials and engaging learner motivation. On the other hand, selecting proper instructional media can also facilitate students who have difficulties in providing specific instructional media. For instance, students who come from lowest income family are faced difficulty in providing personal computer/laptop. Several teachers suggested to uses mobile phone as the alternative, while the other teachers projected the material using LCD projection so each students can participate without using personal devices.

This aspect is also emphasized on the use of ICT for assessment. As an integral part of instruction, assessment has important function to determine whether the goals of education are achieved successfully or not. Jonassen et al. (2005) also mentioned that assessment is most vital aspect in teaching and learning process, in which the assessment is the tendon Achilles in formal education. Many scholars and educator believes that the present of modern technology is effectively to help the process of assessment including creating task assessment, delivering the assessment, and grading. According to Marina (2016), the implementation of ICT for assessment is essential for every schools and educational institutions to promote a better assessment. Due to
digitalization of education in Indonesia, teachers are emphasized to integrate ICT in supporting their activity including assessment. This study also shows majority of teachers are used ICT for evaluation tools frequently (Table 2). The national regulation is becoming the main reason teachers to used ICT as evaluation tools. The swift of assessment policies have received many complain from at first. This resistance is caused by the inability of teacher using the ICT application. Due to implementation of policies, the teachers are started to realize that the evaluation using ICT is more effective and efficient rather than traditional assessment. In brief, the teachers who has concerned on integrating of national curriculum into ICT and conduct an assessment using ICT media is assumed as qualified teachers (Redecker, 2013).

Table 2. Aspect of curriculum and assessment

<table>
<thead>
<tr>
<th>Item</th>
<th>Result in percentage</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td>I use ICT media that is constructed based on national curriculum standards.</td>
<td>-</td>
</tr>
<tr>
<td>I select the ICT devices in the learning process based on the classroom condition and students characteristic.</td>
<td>3.3%</td>
</tr>
<tr>
<td>I use ICT multimedia applications such as spreadsheets, online rubrics, etc. as evaluation tools for learning outcomes.</td>
<td>7.7%</td>
</tr>
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</table>

Pedagogy

The third aspect is about pedagogy which is emphasizing teachers must know the right moment to use ICT for class activities, as well as assist the teacher's role in modeling the learning process, guiding students' understanding, and creating situations where students could develop their skills. Pedagogy is well-known as the approach and act of how teacher teach. Pedagogy is not only about teaching technique but how the teachers also induce teachers’ belief, social value and social culture into teaching and learning process. Pedagogy is also emphasized on meaningful interaction between teachers and learner in which the present of respect as the center of that interaction.

Many experts in education beliefs by having well understanding towards pedagogy can positively affected to teachers performance, even the student learning process can be more effective. The proper approach in teaching will help learner to activate their higher thinking capability. The present of ICT technology is creating new approach in teaching, and turning it as pedagogical tools. ICT as a pedagogical tool is known as a teachers knowledge, skills, and attitudes in applying technology for their professional activity including
planning a lesson, research, communication, professional development, and self-development (Machumu et al., 2018). As pedagogical tools, the use ICT technology should be accurately promoting learning materials to achieve educational goals. Marpanaji et al. (2018) mentioned that instructional media is chosen to present the learning content and objective. Moreover, the compatibility of ICT media to the content of educational curricula has benefit to ensure that learner in obtaining appropriate levels of information (Chaudhary, 2018). As study revealed that teachers have a concern in selecting ICT media based that can effectively present learning content (Table 3). Teachers have mentioned by using correct and suitable instructional media with the learning content will facilitate information and knowledge transfer in more effectively. Additionally, the use compatible ICT media to learning content shows high engagement of student towards the learning content, and reduce boredom.

Teaching and learning in 21st century is highly stressed on constructivism learning theory. According to constructivism view towards ICT as pedagogical tools, the traditional approach in teaching and learning was restructuring in terms of collaboration as a shift of traditional relation between teacher and learner, and shifting of domination of teachers-centered into students-centered. Learning activity that emphasized on student-centered and collaboration is allowing learner to develop their cognitive flexibility, articulating their learning reflection, and improve their social interaction. Additionally, Sangra & Gonzalez-Sanmamed (2010) mentioned the collaboration as the important element in learning activity. The present of ICT is positively supporting collaboration learning by make the collaboration process more efficient. Moreover, ICT is also contributed to build positive attitudes towards collaborative learning. Nowadays, many educators have concerned in ICT implementation that promote collaboration learning and student-centered approach (Table 3). Teachers believe these strategies and approach could stimulate learner in constructing their own understanding based on their experiences which is a part of meaningful learning. Moreover, teacher also mentioned the increase of learner involvement in classroom activity. According to the study conducted by Reif et al. (2015), student-centered practices can essentially increase students engagement and ownership towards learning activity.

Table 3. Aspect of Pedagogy

<table>
<thead>
<tr>
<th>Item</th>
<th>Result in percentage</th>
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</thead>
<tbody>
<tr>
<td>I consider ICT learning media that I use has compatibility to the learning content.</td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td>0.7%</td>
</tr>
<tr>
<td>I use ICT learning media that promote student-centered learning</td>
<td>2%</td>
</tr>
<tr>
<td>I use ICT learning media to provide learning activities that</td>
<td>0.3%</td>
</tr>
</tbody>
</table>
As a part of constructivist learning theory, students-centered approach become a trend in 21st century classroom and it supposed to promote learning that stimulate 21st century skills such as critical thinking and problem solving. Critical thinking and problem solving is the most important in formal education (Atsoglou & Jimoyiannis, 2012; Karyotaki & Drigas, 2016). The demand on critical thinking and problem solving is based on the demanding skills in workplace. According to World Economic Forums for the future of jobs report (World Economic Forum, 2020), critical thinking and complex problem solving is becoming the top five of the most demanding skills for workplace in 2025. In Indonesia, problem solving and critical thinking are included as the most emerging skills in the workplace. Consequently, teacher must create learning environment which is enabling learner to engage critical thinking and problem solving. According to the study result (Table 3), it shows most teachers attempt to integrate learning strategies that stimulate learner problem solving and critical thinking. According to teachers’ statement, they promote problem solving and critical thinking by imposing real world cases and phenomena into learning activity. Hence, learner can activate their prior knowledge to solve an occurring problem. However, there are also teachers who implementing critical thinking and problem solving occasionally state their argument that the lack time to prepare a proper material is becoming the major reason, while the other said several learning content are not suitable to impose problem solving and critical thinking. Previously, the present of authentic activities is mentioned as an important element to promote problem solving and critical thinking in learning activity. Nowadays, the present of modern ICT technology is considered as effective tools to provide authentic learning properly (Saravanakumar, 2018). Teachers is also shows their high consideration in using instructional media that promote authentic activities (Table 3). Teachers revealed that authentic activities can provide actual phenomena which can facilitate learner to understand learning content more deeply. The other teachers also states the benefit authentic activities can prepare learner with the condition that learner might faces in their future career. As Oliver & Herrington (2000) states that the application of ICT for learning is considered to successfully engage for the real-world activities through the concept of situated learning strategy. In brief, concerning the

| I use ICT learning media that promote authentic content based on current events. | 0.3% | 3% | 25% | 48% | 23.7% |
| I use ICT learning media that promote critical thinking and problem-solving. | 0.3% | 2.7% | 20% | 41.7% | 35.3% |
| I use ICT learning media that promote collaboration for students to construct their knowledge. | 1.7% | 2.7% | 20% | 41.7% | 35.3% |
pedagogical element in implementing ICT as instructional media is a key success to promote meaningful learning, and effectively engage learner motivation. As educational scholars mentioned that the correct used of technology enhanced classrooms will affect learning process holistically in promoting constructivist learning, and demanding skills for 21st century.

Digital Skill

Nowadays, the demand on technological literacy is becoming a requirement for teachers to possess digital skills. Possessing a proper digital skill will assist teacher to select and evaluate proper resources and instructional media that used for teaching activities. This aspect discuss about the application of digital skill which is emphasizing teachers knowledge about the basic operations of ICT technology. Defining the essence of teaching will directly determine which digital skills are demanding by teachers. Teaching has essential purpose on delivering, enriching, remediating, and monitoring of students learning. Hence, the teachers should possess several important ability such content presentation and delivering, word processing, information management, and electronic network usage. Moreover, Mahdum et al. (2019) proposed several standard that used for assessing teacher ICT competencies as follow: (1) operating computers; (2) possess ability for installing, assembling, setting-up, maintaining, and solving problems of personal computers; (3) computer programming; (4) word processing; (5) spreadsheet; (6) managing databases; and (7) creating interactive presentations as interpersonal communication (Mahdum et al., 2019).

Understanding the function of hardware and software is the most essential part in operating ICT technology. Having this knowledge will support teacher to implementing various learning using ICT as instructional media. Lack of this knowledge is one of the major reasons why teachers are avoiding ICT technology implementation as instructional media. The result of study revealed that majority teachers can operate hardware and software supporting ICT technology. Moreover, most teacher response shows positive response in applying online ICT application for learning purpose such as using search engine, downloading the information, using hyperlink media, and using online communication tools. Seeking the reason of how teachers having that knowledge and ability in implementing ICT technology. The most common answered is the shifting of regulation from government that required teacher to conduct the professional work using ICT technology. On the other hand, the youth generation teacher mentioned that they exposed by ICT technology since an early age. According to the result of study, it can conclude that majority of Indonesian teacher already have good skill in empowering ICT media for learning purposes. According to Organisation for Economic Co-operation and Development (2001), teachers must possess by wider range of technical and pedagogical skill, and continuous self-improvement in updating the latest trend of technology and modes of use. Moreover, lack of ICT knowledge and skill
can be affected to teacher perspective toward ICT use for teaching and learning activities (Mahdum et al., 2019).

Table 4. Aspect of digital skill

<table>
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<tr>
<th>Item</th>
<th>Result in percentage</th>
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<tbody>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td>Operating ICT hardware for learning activities.</td>
<td>-</td>
</tr>
<tr>
<td>Operating productivity software (such as word processing, presentations, graphic design, etc.).</td>
<td>0.3%</td>
</tr>
<tr>
<td>Using search engines (Google search) in finding learning content.</td>
<td>-</td>
</tr>
<tr>
<td>Downloading the information and learning content from the website.</td>
<td>-</td>
</tr>
<tr>
<td>Using hyperlink and hypermedia to provide learning content</td>
<td>0.3%</td>
</tr>
<tr>
<td>Using online communication tools such as e-mail and social media for learning purposes.</td>
<td>-</td>
</tr>
<tr>
<td>Installing educational software independently</td>
<td>2%</td>
</tr>
</tbody>
</table>

Organization and administration

The fifth aspect is Organization and Administration, which is emphasizing on the guarantee access of the internet to the whole class including group and individual activities, and also flexibly applying technology to support collaboration (Table 5). The study revealed that teachers used the ICT facilities provide by schools is still low. The lack of proper facilities provided by schools is a common reason, especially for schools that located on remote area. According to survey in 2015, there are only 58% from total schools in Indonesia (118,000 schools) have access to the internet. It should be also noted that 17,000 schools in Indonesia have difficult access for electricity (Retnawati, 2019). Teachers also complained the numbers of distributed facilities are still limited. This phenomena shows Indonesia have similar back story about inequity through-out the years.

Overcoming the lack of facilities in schools, many educators are suggested learner to use personal ICT devices to support classroom activities. This typical approach is known as BYOD (Bring Your Own Devices), which is emphasize students to bring their private devices for learning purpose. BYOD has benefit to overcome the lack of ICT distribution among learner during classroom activity (McLean, 2016). Moreover, teacher should possess proper competencies include an ability and knowledge to effectively integrate the devices into classroom activity (Rae et al., 2017). In brief, teachers are rarely
used the facilities provided by several reasons such limited resources provide by school. However, the teacher is already familiar with technology as instructional media and employed some strategies to overcome the limitation of ICT devices.

Table 5. Aspect of organization and administration

<table>
<thead>
<tr>
<th>Item</th>
<th>Result in percentage</th>
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<tbody>
<tr>
<td>I use the facilities which is provided by the school in the learning process (such as computer laboratory, LCD Projector, etc).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td>15.7%</td>
</tr>
<tr>
<td>I emphasize students to use personal ICT devices to support the learning process.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4%</td>
</tr>
</tbody>
</table>

Teacher Professional Development

The last aspect is emphasized teachers in applying ICT media to prepare additional learning material, developing their pedagogical knowledge, and collaborating with the experts and fellow teachers in supporting their professionalism as a teacher (Table 6). Teacher professionalism is not just about pedagogical aspect, the other aspect is also becoming important element to support their professionalism such social interaction, personal character, and their desire to growth. Supporting the development of teachers’ professionalism, the role of ICT media is not only as a pedagogical tools but also supporting the development of teachers and educator professionalism. Thakral (2015) mentioned that ICT is a powerful and effective tool to facilitate teacher professional development. This statement was proved by recent study that shows teachers high frequencies in using ICT media to support their self-improvement, and also updating their knowledge about new findings on their related subject. Discussing about finding new knowledge to support on teacher related subject, majority teachers have an agreement on the ICT effectiveness in gathering learning content. Teachers mentioned that the ability of search engine as a collecting and seeking tools is becoming the main reason teacher made their choice for ICT media rather than conventional media. Strengthen the claims, Thakral, (2015) states the present of ICT media is highly supported teaching activities by enhancing the initial preparation. Furthermore, the roles of communication and collaboration are also emphasized on teacher professional development. The importance of having a contact and communication between teachers is allowing them in possessing more knowledge construction approach to learning. Moreover, it also increased teachers’ positive attitude toward the other teacher, such appreciate the views and experiences of other teachers (Organisation for Economic Co-operation and Development., 2001). The result of study shows the majority of teachers are often using ICT media as communication and collaboration tools with
educational experts and other teachers. According to teacher sample in this study, sharing information about educational policies, evaluation format, administrative task, and consulting about teaching strategy is the most common topic.

Additionally, this study also assessed the ability of ICT technology as administrative tools. The result shows high intensity of teachers use ICT technology to carry out their administrative tasks. Teachers stated that completing an administration task today is more complicated without using technology. The features in shorting and selecting data for managerial purposes are the reason why teachers highly depend on technology.

### Table 6. Aspect of curriculum and assessment

<table>
<thead>
<tr>
<th>Item</th>
<th>Result in percentage</th>
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<tbody>
<tr>
<td>I use ICT devices in all teaching activities and for teachers' administrative activities.</td>
<td>1% 5% 30.7% 33.3% 30%</td>
</tr>
<tr>
<td>I use ICT media to improve my professional skills as a teacher and updating my knowledge about recent issues associated with my teaching subject.</td>
<td>0.7% 6.3% 27.3% 34.7% 31%</td>
</tr>
<tr>
<td>I use email and social media as collaboration with educational experts and fellow teachers.</td>
<td>1.3% 6% 22.7% 48% 22%</td>
</tr>
<tr>
<td>Internet and online media helps me in gathering learning content rather than using conventional media (books, encyclopedias, etc.)</td>
<td>Strongly disagree Disagree Undecided Agree Strongly agree</td>
</tr>
</tbody>
</table>

Strongly disagree Disagree Undecided Agree Strongly agree

In conclusion, teachers’ ICT competency is related to knowledge and skills about ICT. The lack of teachers’ competency can affected their enthusiastic to the implementation of ICT in teaching and learning activities. According to the previous result shows Indonesian teachers show positive responses in almost all aspect of ICT competences that identify them for possessing good ICT competencies. The high attribute aspects are including the curriculum and assessment, pedagogy, digital skill, administration, and professional learning. While the aspect of understanding ICT in education policies is the only aspect which has low attributes. This aspect was identified how Indonesian teachers lack innovation and idea contribution to ICT development for learning. Vitanova et al. (2015) are also suggested several strategies to achieve higher level of teachers ICT competencies by increasing the use of ICT in professional manner,
include: (1) Having online communication with colleagues; (2) Using web resources, consumables, and software to create learning material; and (3) Using ICT to conduct administrative task.

**Identify Obstacle Using ICT**

The importance of ICT is not only achieving the educational, but also becoming the important factor to complete restructuring of the educational system, promoting new interactive models of education, new educational pedagogy, and emphasizing on lifelong learning (Vitanova et al., 2015). However, teachers face several obstacles when applying ICT as instructional media. The obstacles of using ICT media could be determined into two types based on teacher perspective which are external and internal obstacle. Indicating the obstacle in learning through ICT media, this study conducted an open-ended interview which consists of 5 main questions. The interview is conducted for a randomly selected teacher (15 people) which is divided into three different age group, that is young teachers (20-30 years old), middle-age group teacher (31-50 years old), and elderly teacher (>50 years old).

The first question is addressing on assessing internal obstacle during apply ICT media. The question asked “How do you know about using technology in learning process?” Majority of the age group are positively response towards the role of ICT technology. They believe that ICT technology is greatly beneficial to provide learning material, especially for a difficult topic. The middle age and elder teacher also mention that ICT technology helping them to improve their professional skill and completing professional administration requirement. In brief, teachers have positive attitude towards the ICT technology and showing no rejection to the use of ICT for educational purpose. Teachers’ negative attitude towards ICT use in classroom is greatly affected by lack of skills and knowledge in operating ICT software or hardware (Ghavifekr et al., 2016).

The external obstacle in applying ICT is examined by administered three question, as follow: (1) “Does your Institution facilitate of using technology in learning activity?”, (2) “Is there any technical obstacle in technology’s implementation?”; and (3) “Does the use of ICT for learning is more efficient or time consuming in teaching process?”. The first question is identifying the support of institution in providing technology for learning purposes. Majority of the teacher said that the school already distribute basic support but limited. However, several teachers argued that the quality of facilities depends on the schools' condition including location, school society, and government support. Moreover, several teachers mentioned if their schools in Indonesia which have a regulation to prohibit the use of personal gadget during learning process. They argued that the use of technology during learning process could distract learners’ attention.

The second question is addressed to the technical issues during implementing ICT technology. Majority of teacher mentioned connectivity to internet to conduct online learning, especially for the school which located in
rural area. Additionally, the elder teachers had mentioned the issues such as lack of training in operating recent ICT software and hardware. Providing a proper technical support is crucial for teacher, so teacher can focus to deliver their subject material (Ping et al., 2003). The last question is addressed to the efficiency of using ICT for learning. Majority of respondent said the use of technology could reduce time-consuming during learning process, especially for a difficult topic. However, the young teacher and middle age group mentioned the specific topics that are time-consuming during the preparation process. Strengthen the claim, the previous study shows similar external obstacle face by teacher such: (1) Unstable internet connection and electricity; (2) Lack of ICT-related training; (3) Small number of ICT media distribution and limitation access to schools facilities such as computer laboratory; and (4) Limited time for teachers to design their own learning media (Mahdum et al., 2019). The interview also administers question about the type of ICT hardware and software that teacher used during teaching process. All of respondent mention Laptop and PC are the most favourable use during learning process, and there are only 10 respondents who use smart phone frequently. Besides that, Google (search engine) and Microsoft office are still the most favourable software application used for learning purpose. The YouTube video web is the second favourable software application which most teachers used to provide a real-world example for teachers. While there are only 5 respondents are using Learning Management Systems (such as Edmodo app. Google classroom, etc) to facilitate teaching and learning activities.

In conclusion, the importance of identifying the obstacle is the vitals area in developing teacher competencies. Indonesia government needs to improve classroom management, and modern classroom management must involve technology in its planning, material selection, methods selection, and evaluation activity (Syahid et al., 2019). The recent study identifies the internal obstacles such as lack of self-confident, negative attitude towards change, and having a poor perception towards technology are not the major issues which facing by teachers today. However, teachers still having issues about external obstacle during applying ICT for learning purposes such as the lack of access toward resource, proper training, and technical issues. The key factor in use of ICT is sufficient computer labs and ICT equipment. On the other hand, the teacher had used their own personal ICT technologies and various software applications for supporting their teaching professional activities (Ghavifekr et al., 2016).

Conclusion

The recent study has aimed to identify teacher competencies in integrating technology for learning activities that referred to the standard competencies for teacher released by the Indonesian Ministry of Education, and also attempted to indicate the obstacle in performing ICT in the classroom. The study revealed that Indonesian teachers have good level of ICT competencies. However, some
teachers still lack innovation and idea contribution to ICT development for learning. On the other hand, the teachers have shown a positive attitude toward ICT technology. However, some teachers are still lack of ICT technology access and training. According to the Ray Clifford quotes said “Computer will not replace teachers. However, teachers who use computers will replace those who don’t”. This quote is giving the message that ICT competencies (including skill and knowledge) for teachers are important in modern education. Teacher who has high level of competencies is considered as a competitive teacher rather than the others who have negative views towards ICT. Additionally, having an outstanding ICT competency is not merely enough for teacher, the ability in overcoming any internal and external obstacle is also important for teachers.

References


