The Learning Innovations Through Using of ICT in Junior High School at Semarang

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Abstract
The research problems that exist: (1) to what extent is the readiness of teachers in junior secondary schools throughout Semarang in innovating learning through the use of ICT to improve the quality of learning ?, (2) how is the effectiveness of ICT implementation being carried out?, (3) what are the obstacles faced by teachers in using ICT? Sources of data used include: (1) Human sources (respondents), including: school principals, teachers, ICT operators, stakeholders, students, and (2) Non-human resources, including: Teacher performance documentation (including: learning planning, implementation and evaluation product documents). The data collection techniques used included: a questionnaire supported by documentation study and interviews. The data analysis technique used a qualitative descriptive technique. The results showed: (1) Readiness of teachers in junior secondary schools throughout Semarang in innovating learning through the use of ICT to improve the average quality of learning in a ready condition, (2) Implementation of ICT in the Education Process, in general, it has shown that the ICT implementation technique is effective, (3) As for the obstacles faced by schools in the use of ICT, in general, each school has shown effective ICT implementation techniques, without any significant obstacles.

Keywords: ICT, Implementation, Learning innovation, obstacles

1. Introduction
In line with the demands of high educational qualifications and the dense workload of teachers, as well as the rapid development of information and communication technology (ICT), these days require the skills of teachers to immediately apply them in the learning process. Alternative telematics programs from various on-line learning resource facilities, such as: e-d Pendidikan.net, on-line tutoring and jardiknas; as well as other on-line programs, such as: TV-E, Radio-E Education, Electronic Bulletin (which is produced and coordinated by the Ministry of National Education Pustekkom), ready to be accessed on designated sites and programs, requiring the willingness and ability of teachers as learning practitioners to use it in innovating the learning process as effectively as possible.

Teachers as practitioners and main actors who are always in direct contact with students, can be direct examples or role models for students in using ICT tools in the learning process at school. So far, people think that teachers are human beings who know best in the eyes of their students. This presumption may still be attached to Kindergarten children today; However, along with the development of digital technology, the current condition is not the same, teachers' knowledge can be the same as students, even students can first get to know from their teachers. It all happened because of the development of information media that shot like a meteor. Currently teachers are no longer the only
In particular, this study aims to:

1. to know the extent of the readiness of teachers in junior high schools throughout Semarang in innovating learning through the use of ICT to improve the quality of learning;
2. knowing how the effectiveness of ICT implementation by teachers?
3. knowing what obstacles are faced by teachers in utilizing ICT?

1.1 Objectives

The purpose of this study in general is to determine the readiness of school infrastructure in a way, the readiness of teachers and ICT operators in SLTPs throughout Semarang City to innovate learning through the use of ICT to improve the quality of learning, and the effectiveness of ICT implementation along with the constraints involved. faced by schools, teachers and ICT operators.

In particular, this study aims to:

1. to know the extent of the readiness of teachers in junior high schools throughout Semarang in innovating learning through the use of ICT to improve the quality of learning?
2. knowing how the effectiveness of ICT implementation by teachers?
3. knowing what obstacles are faced by teachers in utilizing ICT?
2. Literature Review

2.1 Information and Communication Technology (ICT):
Information and Communication Technology (abbreviated as ICT) which in English: "Information and Communication Technologies (abbreviated as ICT) by the Indonesian Language Wikipedia, includes all technical equipment for processing and conveying information. ICT includes two aspects, namely: information technology and communication technology. Information technology, including: all matters relating to the process, use as a tool, manipulation and information management. Meanwhile, communication technology is anything related to the use of tools to process and transfer data from one device to another. More specifically, Kemp 1985 in Kustiono (2010) emphasizes that communication is the process of delivering messages interactively with or without means, from communicator (sender) to communicant (receiver). In general, communication is carried out verbally and verbally which can be understood by both parties. If there is no verbal language they can understand, communication can still be done by using body movements, showing certain attitudes, for example smiling, shaking their heads, shrugging their shoulders. This method is called nonverbal communication language. Therefore, information technology and communication technology are two inseparable concepts. So Information and Communication Technology contains a broad definition, namely all activities related to processing, manipulation, management, transfer of information between media. The term ICT emerged after the combination of computer technology (both hardware and software) with communication technology in the mid-20th century. The combination of the two technologies is growing rapidly beyond other fields of technology. Until the early 21st century, ICT is still undergoing various changes and the saturation point has not yet been seen.

2.2 Utilization of ICT as A Learning Media
The study of ICT as a learning medium can be examined from at least 4 aspects of the study, namely: (1) educational aspects, (2) technological aspects, (3) communicative aspects, and (4) psychological aspects. The educational aspect mandates that the presence of ICT is at least able to make a positive contribution to the learning process. As a learning medium, any form of ICT, whether ordinary teaching aids (such as: 2-dimensional or 3-dimensional tools) or forms of audio, audio-visual, computer-based media (can use CD Room) for off-line learning and integrated media internet-based for on-line learning and/or telematics for students; so that its presence, ICT is able to provide added value for the achievement of changes in teaching behavior as competed, covering both cognitive, affective and psychomotor aspects of learning proportionally.

The added value in question includes: (1) There is direct interaction between users and individual learning materials, (2) ICT can increase students' learning motivation, (3) ICT is able to condition students to learn continuously and independently, (4) By learning through ICT, there is feedback on student responses; (5) ICT can overcome the physical limitations of class, space, time and students' sensory observation, (6) ICT is able to avoid the possibility of verbalism (Sheel & Richey, 1994).

The technological aspects of ICT include the idea of a technique to use it as a transmitter. As a transmitter, ICT can be used conditionally, it can be off-line and also on-line (for computer-based and internet-based ICT); so that the presence of ICT is able to condition students to learn in a conducive manner both individually (user, one to one) as well as in groups and even classically. According to Haney & Ullmer (1981) the use of ICT as a telematics device in the student learning process, technologically, can be explained in 3 alternative implementations, namely:

1. Implementation of a web course; all materials, discussions, consultations, exercises, and carried out separately, through the following facilities: e-mail, chat-rooms, bulletin boards, and online conferences;
2. Implementation of a web centric course; some of the materials, discussions, consultations, exercises, are carried out via the internet; exams and some materials, consultation, face-to-face teacher-student, of less intensity;
3. Implementation of a web enhanced course; Internet learning is less than face-to-face; the internet as a content provider and provides the facility to “link” to various sources.

The communicative aspect of ICT, includes the idea of a technique for delivering various forms of ICT as a transmitter. It should also be understood that ICT as a learning medium includes aspects of software, hardware and transmitters. Aspects of software, include tools that contain material that can be packaged in various forms, such as: floppy disks, CDs, tapes, and programs and other forms that contain certain materials that are selected and planned to be studied. Of course, these software require hardware to present all the contents of the learning material that they contain and want to learn. The two tools, both software and hardware, are inseparable. Software without hardware, cannot be presented, and vice versa, hardware without software is meaningless because it is empty without content / material to
be studied. The two tools, according to Kemp (1985), will play an integrated role as an intermediary in the delivery of learning messages (transmitters) from the source, in this case, among them are junior high school teachers to the recipient (receiver), who among them are junior high school students who are doing learning activities, either regularly, off-line or on-line.

The psychological aspects of ICT include the idea that with the use of ICT as an integral component in the learning process, it has the ability to increase students' interest in learning motivation, students become more enthusiastic about learning with all their mental, emotional, and social involvement so that it is hoped that ICT can condition student learning active, varied, creative, constructive, and fun.

As stated by Sadiman, et al. (1984: 14), there are various psychological problems (noise) that affect the learning process, such as: lack of interest, low intelligence; and physiological barriers, such as: fatigue, sensory limitations; ICT as a medium is able to help students overcome these things.

By looking at the contents of the curriculum, teachers must integrate ICT in the teaching and learning process in schools not only for technology and information subjects. Seeing the current condition of ICT and its development in the future, teachers must immediately prepare themselves and make careful planning in implementing ICT in schools. There are important things that must be considered in utilizing ICT as a learning medium, namely the available hardware and software and the types of learning methods to be used. The several uses of ICT in learning include:

1. **Presentation;** The equipment used today usually uses a computer / laptop and LCD projector. There are several advantages if we take advantage of ICT, among them we can display animation and films, so that the appearance becomes more attractive and makes it easier for students to capture the material we convey. The most widely used software for presentations is Microsoft Powerpoint. There are several things that must be considered in making presentation materials, including: (a) Do not have too much writing to display, (b) The writing should not be too small because it has to be seen by many students, (c) Add lots of pictures and animation, (d) Try to make an interactive presentation (Kustiono, 2010).

2. **Demonstration;** Demonstrations are usually used to show an activity in front of the class, such as experiments. The teacher can make a film of ways to do an activity, for example: how to take measurements with the correct micrometer or take some important activities, so that in this way we can direct students to do the right activities or draw conclusions from these activities. Another way is to use internet media, we can display animations related to the material we teach (although not all of them are available).

3. **Virtual Experiment;** The purpose of the virtual experiment here is a laboratory activity that is transferred to the computer. Children can do several experiments using virtual experimental software, for example Crocodile Clips.

4. **Virtual Classroom;** The meaning of virtual classes here is that students learn to be web-based on their own, for example using moodle, the author provides an example of a virtual class form that is being developed in MAN 2 Ciamis. In this virtual class students will get material, assignments and online tests. We as teachers find it easy to check assignments and assess student test results. Especially the results of student examinations will be assessed automatically.

### 2.3 Classification of ICT and Its Implementation in Schools

The use of ICT software and hardware in learning includes software and hardware that are included in the media classification as recommended by Sheel and Richey (1994), there are five media classifications that are developed (by design) or by utilization, namely: (1) visual media, (2) audio media, (3) audio-visual media, (4) computer-based media (off-line), and (5) integrated media, based on the internet (on-line); so that the identification of ICT software and hardware used is also moved from the five existing media classifications.

Basically, ICT software are programs that contain messages to be transmitted relating to the completion of certain tasks or activities in order to achieve certain competencies or learning objectives. This ICT software can be classified into two forms, namely: computer software and non-computer software.

For computer software, it is a computer program or a series of commands in codes that are recognized by the computer to complete a certain task. According to Wibawanto (2009), possible computer software can be used for learning, including:

1. Manuscript processing software, namely software used as a tool for typing, editing, and layouting of manuscripts; like Microsoft Word, open officer writer, abiword, and so on; which can be applied for making learning planning documents, compiling handouts or other teaching materials (including for e-books), and various other learning documents;
(2) Number processing software (*spreadsheet*), which is software designed to process numbers including calculating student achievement scores and other financial reporting materials, such as: Microsoft Office Excel;

(3) Presentation software, which is software used to display presentation slides through a projector. Presentation of the preparation of teaching materials in this training can be done with the help of this software, for example: with Microsoft Power Point software, which is one of the most popular presentation software. This visual presentation software is a method that has long been used by presenters, using various projector equipment, such as: OHP, slide projector, microfilm projector, microfish projector or in the form of two-dimensional visual media, such as: flip charts and pin charts that are packaged in standard flipcharts, and so on. Equipment that is now often used is usually a combination of a computer / laptop with an LCD (Liquide Crystall Display);

(4) Animation software, which is software used to design and display animation of a display. Macromedia Flash and Swismax are two fairly popular animation software.

Non-computer ICT software can be identified as a form of software containing messages to be learned manually, such as:

1. Two-dimensional visual software, such as: pictures, photos (photographic results), various charts, OHT, slides, microfish, microfilm, and other printed learning materials;
2. Audio software, such as: audio recording cassettes, MP3, MP4, and the like;
3. Video software, such as: video tapes, films, audio CD / DVD discs, MP3 and MP4 unitset, and the like.

ICT hardware is basically a product of technological engineering or human cultivation that is tangible, can be seen and felt, which can be used as a tool or media in the learning process, such as:

1. Visual media hardware, such as: standard flipcharts, tustels (manual or digital), OHP (Overhead Projector), LCD (Liquide Crystall Display), slide projector, microfish projector, microfilm projector; manual cameras, automatic cameras, high-resolution digital cameras (more than 10 megapixels), micro168 cameras (for photo functions), and the like;
2. Audio hardware, such as: tape recorders, telephones, cellular telephones (Handphones), digital voice recorders, and the like;
3. Video hardware, such as: handycames, video cameras, video players, digital video recorders, cell phones, instamatic digital tustels, micro168 cameras (for video functions), and the like;
4. Computer hardware, which is equipped with various software, such as: script processing; number processing (*spreadsheet*), such as: Microsoft Office Excel; presentation software; like microsoft power point; animation software, such as: macromedia flash and swismax, and other cutting-edge software.

Based on the theoretical study related to ICT above, and considering the extent of application of ICT in human life, the implementation of ICT integration in the learning process, the author limits the implementation of: (1) multimedia learning, (2) e-learning (internet as learning media), (3) website-based learning, and (4) computer-assisted learning.

### 2.4 Teacher Competence in Transforming Teaching Through ICT

The expected competence of the teacher is related to the ability of the teacher to organize a class-based learning environment by using teamwork to achieve teaching goals, namely:

1. Be able to describe difficulties in using ICT to achieve planned learning objectives;
2. Understand the differences between students based on their competencies in using ICT;
3. Have strategies for managing these differences in teaching.

The expected competence of the teacher is related to the ability to decide when all multimedia presentations by the class or group will be useful, namely:

1. Changing the type of presentation or learning materials according to the main objectives and teaching methods;
2. Analyze a presentation in terms of readability, structure, coherence with purpose and suitability for students.

The expected competence of teachers is related to the ability of teachers to analyze multimedia education software that is specific to subjects, including:

1. Evaluating CD ROM, web site, video and audio, educational media software;
2. Assess the activities proposed for students and the contribution of these activities to learning goals;
3. Analyze the specific contribution of ICT tools to student learning.

The expected competence of teachers is related to the ability of teachers to help students find, compare, and analyze information from the Internet, and from other sources specific to a subject, including:
(1) Teach students to construct simple quests; 
(2) Helping students organize, criticize, synthesize and present information using ICT tools.

3. Methods
The design of the research method used in this study is a qualitative descriptive research approach; because this research will describe objectively the reality in the field related to the implementation of ICT in the learning process in junior high schools (SMP) in the city of Semarang. This research approach will try to describe the various problems studied in terms of quality and quantity, the constraints and carrying capacity associated with learning innovation through the implementation of ICT in junior high schools (SMP).

This research is looking for innovations to improve the quality of learning at the junior secondary education level, especially in junior high school education units, both public and private in the city of Semarang by conducting a study on the readiness of teachers to utilize ICT in an effort to improve the quality of learning, the effectiveness of the implementation of ICT applied and strict in implementing ICT as a medium or learning resource.

Subjects in this study were school principals, public and private junior high school teachers, stakeholders (for example: junior high school supervisors), and students, including the Expert Team, including: ICT Experts and Learning Experts, whose selection was made according to the interests of this study. namely monitoring learning innovation efforts and developing teacher performance through the use of ICT in schools.

The data that the researchers had collected included: data on the implementation of innovative learning through the use of ICT, including data on: (1) the readiness of junior high school teachers both individually and collectively in the use of ICT, (2) the effectiveness of ICT implementation, (3) obstacles faced by teachers in utilization ICT.

Sources of research data that researchers use include:
(1) Human resources (respondents), including: school principals, teachers and junior high school ICT operators, both public and private, stakeholders (for example: SMP supervisors), and junior high school students, including experts, include : ICT expert, learning expert;
(2) Non-human sources, including: (a) teacher performance documentation (including: product planning, implementation and evaluation of learning documents), ICT operator performance documents in the implementation and utilization of ICT; and (b) the quality of student learning outcomes from learning with ICT.

Data collection techniques are the methods used by researchers in an effort to collect research data (Arikunto 2002: 151). Thus the data collection technique in this case involves what techniques or methods the researcher will use in an effort to collect data for this research. Data collection techniques used in this study include: main data collection methods, namely: observation and questionnaire methods; and complementary data collection methods, including: using documentation studies and interviews. The data analysis technique in this study used a qualitative descriptive technique, with the target of data triangulation and source triangulation.

4. Data Collection
The following is a collection of data on: Teacher readiness in learning innovation through the use of ICT, Data on the Effectiveness of Techniques for the Application of ICT in Learning, and Data on teacher constraints / barriers in the application of ICT in the Learning Process, as shown in Tables 1, 2, and 3 below.
Table 1. Data Calculation for Teacher Readiness in Using ICT Facilities and Infrastructure in Innovating the Learning Process

<table>
<thead>
<tr>
<th>No.</th>
<th>Observed Aspects</th>
<th>Respondent Score</th>
<th>Total Score</th>
<th>Average Per-School Qualification</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Availability of school education infrastructure/infrastructure that allows the implementation of ICT in schools, such as: Electricity network, telephone</td>
<td>3 3 3 1 3 3 3 3 3 3</td>
<td>28/2.8</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Availability of internet network (hostpot) in land that allows every teacher and student, especially; and Principals and Tendik in general can access the internet together in their respective classrooms and workspaces</td>
<td>2 3 2 2 3 2 2 1 3</td>
<td>23/2.3</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Availability of internet network (hostpot) in land that allows every teacher and student, especially; and Principals and Tendik in general can access the internet together in their respective classrooms and workspaces.</td>
<td>2 2 1 2 1 1 3 2 1 2</td>
<td>17/1.7</td>
<td>SR</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Availability of internet network (hostpot) in land that allows every teacher and student, especially; and Principals and Tendik in general can access the internet together in their respective classrooms and workspaces.</td>
<td>3 3 3 2 3 2 2 1 3</td>
<td>26/2.6</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Availability of internet network (hostpot) in land that allows every teacher and student, especially; and Principals and Tendik in general can access the internet together in their respective classrooms and workspaces.</td>
<td>2 3 2 2 3 2 1 3 2 3</td>
<td>23/2.3</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>The availability of classrooms equipped with computers (PCs or notebooks) online with CD rooms, LCDs, scanners, printers and various learning software attracts and captivates students' attention.</td>
<td>2 2 1 2 1 1 3 2 1 2</td>
<td>17/1.7</td>
<td>SR</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Availability of adequate computer laboratories.</td>
<td>3 3 3 2 3 2 3 2 2 3</td>
<td>26/2.6</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Availability of internet laboratory, adequate</td>
<td>2 3 1 2 1 1 2 2 2 3</td>
<td>19/1.9</td>
<td>SR</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Availability of School Libraries, adequate</td>
<td>2 2 3 3 3 3 3 2 1 3</td>
<td>25/2.5</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>The availability of an adequate Learning Resource Center</td>
<td>2 2 2 3 2 1 3 2 2 3</td>
<td>22/2.2</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Availability of adequate School Profile Web.</td>
<td>2 3 3 3 3 3 2 1 3 3</td>
<td>26/2.6</td>
<td>VR</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Possible use of e-learning tools in the learning process, such as: TV-e, Radio-e, bulletin-e, etc.</td>
<td>2 3 2 2 3 2 2 1 1 3</td>
<td>21/2.1</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>The conditions of the learning process are interactive, inspirational, creative, fun, challenging, and motivate students to participate actively based on the use of computer and internet learning resources.</td>
<td>2 3 3 3 2 2 3 3 2 3</td>
<td>25/2.5</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Availability of ICT teachers in the rational is adequate</td>
<td>2 2 3 1 2 1 1 1 1 3</td>
<td>17/1.7</td>
<td>SR</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>The availability of non-ICT field teachers who are able to utilize ICT, in particular being able to access the internet as a learning medium.</td>
<td>2 2 3 3 3 3 3 2 2 3</td>
<td>25/2.5</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>The availability of ICT Operators in schools is adequate</td>
<td>3 3 2 2 2 3 1 3 1 3</td>
<td>23/2.3</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>The implementation of various blended learning applications in schools.</td>
<td>2 2 2 3 3 1 3 2 2 3</td>
<td>23/2.3</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Support and positive appreciation from the Government and School Leaders in the effort to implement ICT in schools.</td>
<td>2 3 2 3 3 3 3 3 3 3</td>
<td>28/2.8</td>
<td>SS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Score Obtained</td>
<td>33 39 35 34 37 32 37 30 27 44</td>
<td>348/34.8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average Score Per-School/Total Average</td>
<td>3 4 3 4 3 4 3 4 3 4</td>
<td>32/3.2</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Per-School Qualifications/Average Qualifications</td>
<td>R VR R R R R R SR VR SR/R</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

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Information:

School Readiness Qualifications:

<table>
<thead>
<tr>
<th>Responden</th>
<th>SMP Islam Al Madina Smg</th>
<th>Score Interval:</th>
<th>VR (Very Ready)</th>
<th>Qualification:</th>
<th>Score Interval:</th>
<th>Qualification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responden 2</td>
<td>SMP N2 Semarang</td>
<td>1. 38 - 45</td>
<td>1. 2.6 - 3.0</td>
<td>SS (Very Ready)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 3</td>
<td>SMP N9 Semarang</td>
<td>2. 30 - 37</td>
<td>2. 2.1 - 2.5</td>
<td>S (Ready)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 4</td>
<td>SMP N11 Semarang</td>
<td>3. 22 - 29</td>
<td>3. 1.6 - 2.0</td>
<td>CS (Simply Ready)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 5</td>
<td>SMP N12 Semarang</td>
<td>4. 14 - 21</td>
<td>4. 1.1 - 1.5</td>
<td>KS (Less Ready)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 6</td>
<td>SMP N13 Semarang</td>
<td>5. - ≤ 13</td>
<td>5. - ≤ 1.0</td>
<td>TS (Not Ready)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responden 7: SMP N17 Semarang
Responden 8: SMP N27 Semarang
Responden 9: SMP N37 Semarang
Responden 10: SMP N39 Semarang

Table 2. Calculation of Data on The Effectiveness of ICT Implementation Techniques in Learning

<table>
<thead>
<tr>
<th>No.</th>
<th>Observed Aspects</th>
<th>Respondent Score</th>
<th>Total Score Average</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>In the learning process, ICT has been implemented in various forms of multimedia</td>
<td>2 3 2 3 3 2 3 2 2</td>
<td>2 3 2 2 3 2 2 1 3</td>
<td>26/2.5 E</td>
</tr>
<tr>
<td>2</td>
<td>In certain situations, the learning process has taught students with e-learning (internet as a learning medium)</td>
<td>2 3 3 3 3 3 3 2 1</td>
<td>3 2 3 2 1 3 2 2 1</td>
<td>22/2.2 E</td>
</tr>
<tr>
<td>3</td>
<td>The learning process, the teacher has implemented computer assisted learning; Gadgets</td>
<td>2 2 3 3 3 3 3 2 2</td>
<td>3 2 3 2 2 3 2 2 3</td>
<td>27/2.7 VE</td>
</tr>
<tr>
<td>4</td>
<td>Schools have run school management based on ICT</td>
<td>2 2 3 3 3 3 3 2 3</td>
<td>3 2 3 3 3 3 3 2 3</td>
<td>25/2.5 E</td>
</tr>
<tr>
<td>5</td>
<td>School regulations so that all school communities carry out their main tasks and functions based on ICT</td>
<td>2 2 3 2 2 3 3 2 3</td>
<td>3 2 3 2 3 3 3 2 3</td>
<td>25/2.5 E</td>
</tr>
<tr>
<td>6</td>
<td>The school has implemented the Dapodik Public information system adequately</td>
<td>2 2 3 3 3 2 3 3 3</td>
<td>3 2 3 3 3 3 3 2 3</td>
<td>27/2.7 VE</td>
</tr>
<tr>
<td>7</td>
<td>The school already has a school operator who is professional, creative, and accommodating</td>
<td>2 3 3 2 3 3 3 3 1</td>
<td>3 2 3 3 3 3 3 3 1</td>
<td>27/2.7 VE</td>
</tr>
<tr>
<td>8</td>
<td>The school already has permission to use the Virtual Laboratory Feature on the Learning House Website developed by the Pustekkom Kemdikbud RI</td>
<td>2 2 2 2 2 2 1 3 1 1</td>
<td>3 2 3 3 3 3 3 3 1</td>
<td>27/2.7 VE</td>
</tr>
<tr>
<td>9</td>
<td>There is support from all parties for the school's efforts to innovate education and/or learning.</td>
<td>2 2 3 2 2 3 2 3 3</td>
<td>3 2 3 3 3 3 3 3 3</td>
<td>27/2.7 VE</td>
</tr>
</tbody>
</table>

Total Score Obtained

Per-School Qualifications/Average Qualifications

Average Score Per-School / Total Average

Information:

Implementation Effectiveness Qualifications:

<table>
<thead>
<tr>
<th>Responden</th>
<th>SMP Islam Al Madina Smg</th>
<th>Score Interval:</th>
<th>VE (Very Effective)</th>
<th>Qualification:</th>
<th>Score Interval:</th>
<th>Qualification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Responden 2</td>
<td>SMP N2 Semarang</td>
<td>1. 26 - 30</td>
<td>1. 2.6 - 3.0</td>
<td>VE (Very Effective)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 3</td>
<td>SMP N9 Semarang</td>
<td>2. 21 - 25</td>
<td>2. 2.1 - 2.5</td>
<td>E (Effective)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 4</td>
<td>SMP N11 Semarang</td>
<td>3. 16 - 20</td>
<td>3. 1.6 - 2.0</td>
<td>ME (Moderately Effective)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 5</td>
<td>SMP N12 Semarang</td>
<td>4. 11 - 15</td>
<td>4. 1.1 - 1.5</td>
<td>LE (Less Effective)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responden 6</td>
<td>SMP N13 Semarang</td>
<td>5. - ≤ 10</td>
<td>5. - ≤ 1.0</td>
<td>IE (In Effective)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responden 7: SMP N17 Semarang
Responden 8: SMP N27 Semarang
Responden 9: SMP N37 Semarang
Responden 10: SMP N39 Semarang

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Singapore, March 7-11, 2021

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### Table 3. Data Calculations on Constraints on Implementation of Typical Implementation in Educational and Learning Activities

<table>
<thead>
<tr>
<th>No.</th>
<th>Observed Aspects</th>
<th>Respondent Score</th>
<th>Total Score</th>
<th>Qualification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The availability of multimedia for use in the learning process is limited.</td>
<td>2 2 1 2 2 3 3 2 3 1</td>
<td>21/2.1</td>
<td>S</td>
</tr>
<tr>
<td>2</td>
<td>The student learning process with e-learning (internet as a learning medium) is often constrained by a weak network.</td>
<td>2 1 3 2 3 3 3 2 3 1</td>
<td>23/2.3</td>
<td>S</td>
</tr>
<tr>
<td>3</td>
<td>The learning process of students with the website is still constrained by the weak wifi / network factor</td>
<td>2 1 3 2 2 1 3 2 3 1</td>
<td>20/2.0</td>
<td>QS</td>
</tr>
<tr>
<td>4</td>
<td>Computer-assisted teacher learning process is constrained because not all students have computers</td>
<td>3 1 2 3 2 3 2 3 3 2</td>
<td>24/2.4</td>
<td>S</td>
</tr>
<tr>
<td>5</td>
<td>The school has run school management based on ICT, it's just that not all school communities, especially Tendik, are able to operate computers.</td>
<td>2 1 1 2 2 1 3 1 3 1</td>
<td>17/1.7</td>
<td>QS</td>
</tr>
<tr>
<td>6</td>
<td>School regulations so that all school communities carry out their main tasks and functions based on ICT, it's just that the wifi internet is still inadequate.</td>
<td>2 1 2 3 2 2 3 3 3 1</td>
<td>22/2.2</td>
<td>S</td>
</tr>
<tr>
<td>7</td>
<td>The school has implemented the Dapodik Public information system adequately, but there is no support, especially from all parties in the school community</td>
<td>2 1 1 3 1 2 3 1 1 1</td>
<td>16/1.6</td>
<td>QS</td>
</tr>
<tr>
<td>8</td>
<td>The school already has a school operator who is professional, creative, and accommodating, it's just that the number of school operators is adequate.</td>
<td>2 2 1 2 3 3 3 3 1 1</td>
<td>21/2.1</td>
<td>S</td>
</tr>
<tr>
<td>9</td>
<td>The school already has permission to use the Virtual Laboratory Feature on the Learning House Website developed by the Pustekkom Kemdikbud RI, it's just that there are still some obstacles in its implementation.</td>
<td>2 2 1 1 2 1 3 3 1 2</td>
<td>18/1.8</td>
<td>QS</td>
</tr>
<tr>
<td>10</td>
<td>There is support from all parties for the school's efforts to innovate education and / or learning, it's just that it still seems less serious and consistent.</td>
<td>2 2 2 2 2 3 3 3 3 1</td>
<td>23/2.3</td>
<td>S</td>
</tr>
</tbody>
</table>

**Total Score Obtained**

<table>
<thead>
<tr>
<th>Score Interval</th>
<th>Qualification:</th>
<th>Qualification:</th>
<th>Score Interval:</th>
<th>Qualification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>VS/WC (Very Smooth/Without Constraints)</td>
<td>VS (Very Smooth)</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>VS/WC (Very Smooth/Without Constraints)</td>
</tr>
</tbody>
</table>

**Information:**

<table>
<thead>
<tr>
<th>Responden</th>
<th>Qualification of ICT Implementation Constraints:</th>
<th>Average Constraint Qualification:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SMP Islam Al Madina Smg</td>
<td>1. 26 - 30 VS/WC (Very Smooth/Without Constraints)</td>
<td>1. 2.6 - 3.0 VS (Very Smooth)</td>
</tr>
<tr>
<td>2 SMP N2 Semarang</td>
<td>2. 2.1 - 2.5 S (Smooth)</td>
<td>2. 2.1 - 2.5 S (Smooth)</td>
</tr>
<tr>
<td>3 SMP N9 Semarang</td>
<td>3. 1.6 - 2.0 QS (Quite Smooth)</td>
<td>3. 1.6 - 2.0 QS (Quite Smooth)</td>
</tr>
<tr>
<td>4 SMP N11 Semarang</td>
<td>4. 1.1 - 1.5 KL (Less Smooth)</td>
<td>4. 1.1 - 1.5 KL (Less Smooth)</td>
</tr>
<tr>
<td>5 SMP N12 Semarang</td>
<td>5. - 1.0 TL (Not Smooth)</td>
<td>5. - 1.0 TL (Not Smooth)</td>
</tr>
</tbody>
</table>

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5. Result and Discussion
5.1 Numerical Results
The research results obtained can be described as follows.

5.1.1 Readiness of Junior High School Teachers in the City of Semarang in Learning Innovation Through the Use of ICT

Teachers' readiness to innovate learning through the use of ICT based on data that researchers have succeeded in netting through observations and interviews with competent parties such as: Principals, teachers, laboratory technicians at 10 junior secondary schools designated as research sites, show that the readiness of teachers in SLTP throughout Semarang City Learning innovation through the use of ICT to improve the quality of learning is also on average in a ready condition. Teacher readiness is indicated by obtaining mean scores of 2.2 and 2.1 (ready qualifications).

This condition can be seen specifically, according to the indicated aspects, including:

a. The ability and skills of teachers in presenting learning materials based on computers and/or the internet and other multimedia, were on average quite ready with an average score of 2.0;

b. The ability and skills of teachers in designing and filling out school websites, on average, are not ready, with an average score of 1.6;

c. The ability and skills of teachers in designing and filling out personal blogs, on average, were not ready, with an average score of 1.7;

d. The ability and skills of teachers in designing e-books, on average, are not ready, with an average score of 1.7;

e. The teacher's ability and skills in playing the CD-Room were on average ready, with an average score of 2.5;

f. The teacher's responsibility in equipping students to learn both off-line and on-line, namely: especially in relation to basic computer skills training, word processing, databases and spreadsheets, internet and e-mail, multimedia, and so on, on average. the average is quite ready, with an average score of 2.0;

g. The teacher's attitude towards the government's appeal and the dynamics of science and technology regarding the importance of implementing ICT in the learning process, on average, are quite ready, with an score of 2.0;

h. The teacher's skills for browsing, searching, and e-mailing, in order to navigate on certain browsers and search engines, and the importance of downloading e-mail templates sent by students and how to send e-mails to other students and teachers, are on average quite ready, with an average score of 2.0;

i. The teacher's skills for inserting images and/or videos for the purpose of designing presentation slides are on average quite ready, with an average score of 1.8.

5.1.2 Effectiveness of ICT Implementation by Teachers

Based on the data that the researchers managed to network through observation and interviews with competent parties such as: Principals, Teachers, Laboratory Technicians at 10 junior high schools designated as research locations, it is seen that the effectiveness of ICT implementation as described in Table 2, in general can emphasized that teachers in every school have demonstrated effective ICT implementation techniques in learning innovation. This can be seen in the acquisition of an average score of 2.1 which indicates the qualification is smooth/effective.

This condition can be seen specifically, according to the indicated aspects, including:

a. In the learning process, ICT has been implemented effectively in various forms of multimedia. This can be shown by the acquisition of an average score of 2.5 which indicates an effective qualification;

b. In certain situations, the learning process has taught students with e-learning (the internet as a learning medium). This can be shown by the acquisition of a mean score of 2.6 which indicates very effective qualifications;

c. In certain situations, the learning process has taught students based on websites. This can be shown by the acquisition of an average score of 2.2 which indicates an effective qualification;

d. In the learning process, the teacher has implemented computer and Gadget-assisted learning very effectively. This can be shown by the acquisition of a mean score of 2.6 which indicates very effective qualifications.

5.1.3 Constraints Faced by Teachers in The Use of ICT

The constraints recognized by teachers in implementing ICT, revealed in Table 3, can be emphasized below.

(1) In general, each school has demonstrated effective ICT implementation techniques, without any significant obstacles. This shows that each school in question has succeeded in innovating its learning in particular and smoothly dynamizing education in general. This can be seen in the acquisition of a mean score of 2.1 which indicates the qualification is smooth;
(2) This condition can be seen specifically, according to the indicated aspects, including:
   a. The availability of multimedia for use in the learning process is sufficient in a ready-to-use condition. This can be
      seen in the acquisition of a mean score of 2.1 which indicates current qualifications;
   b. The student learning process with e-learning (using the internet as a learning medium) runs smoothly without any
      significant obstacles. This can be seen in the acquisition of a mean score of 2.3 which indicates the qualification is
      smooth;
   c. The student learning process with the website is still quite smooth, sometimes constrained by the weak wifi/network
      factor. This can be seen in the acquisition of a mean score of 2.0 which indicates that the qualifications are quite
      smooth;
   d. Computer-assisted teacher learning process, smoothly. The problem is that not all students have computers. This
      can be seen in the acquisition of a mean score of 2, which indicates current qualifications;

6. Conclusion
Based on the research results obtained, the researchers can conclude as follows:
(1) The readiness of teachers in making learning innovations through the use of ICT. In general, the average is ready;
(2) The application of ICT in the learning process generally shows that the techniques for applying ICT are effective.
    This can be seen in the acquisition of an average score of 25 which indicates effective qualifications,
(3) Constraints faced by teachers in the use of ICT, in general, every teacher has demonstrated effective and smooth
    ICT application techniques, without significant obstacles.

Suggestion
Related to the conditions of teacher readiness, implementation techniques, and constraints in implementing ICT in
order to improve the quality of learning, researchers can suggest to the principal, teachers and other education personnel
the following:
(1) Increasing the power of internet hot spots, so that the slowness of the internet access process can be overcome;
(2) Equipped with classrooms with off-line computers (PC or notebook) with CD Room; LCD, scanners, printers and
    various other software that attract and captivate students' attention, so that they can support the PAIKEM learning
    process (active, innovative, creative, effective, and fun learning);
(3) Improvement of the internet network (hostspot) in land that can allow each teacher and student to access the internet
    in their class and allow teachers to condition students to learn independently (off-line / on-line);
(4) Consolidating the availability of school websites, so that posting activities, accessing on-line teaching materials,
    serving and interacting with school administrators run smoothly;
(5) The development of an adequate school internet laboratory by not only increasing the number of computer units
    but also managing the network of computer units in a more organized manner, so that the learning process can be
    conditioned more interactively and motivates students to learn independently;
(6) Increasing the pattern of teacher professional development, especially those related to the use of ICT in non-ICT
    subject teachers more intensively, so that the process of scaling up ICT utilization expertise in teachers in other
    non-ICT expertise can be achieved more quickly

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