Teachers' Real and Perceived of ICTs Supported-Situation for Mathematics Teaching and Learning

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Abstrak
Tujuan dari penelitian ini adalah untuk mendapatkan informasi yang berkaitan dengan Infrastuktur, Fasilitas, dan Sumber Daya Teknologi Informasi dan Komunikasi (TIK) di Kecamatan Bojonegara, Provinsi Banten, Indonesia. Paper ini menekankan publikasi hasil tersebut karena informasi itu diperlukan untuk penerapan pembelajaran matematika berbasis teknologi. Metode yang digunakan adalah survai. Instrumen yang digunakan adalah kuesioner, pedoman wawancara tidak terstruktur, dan handycam. Selama survei, total 220 paket kuesioner dibagikan kepada guru, tetapi hanya 119 (tingkat respon 54,1%) yang diisi dan dikembalikan. Sebanyak 12 guru telah diwawancarai dengan lima dari wawancara tersebut direkam dalam video. Beberapa kepala sekolah menyambut baik dan mengizinkan peneliti untuk mengunjungi sekolah mereka dan membuat dokumentasi terkait dengan infrastruktur, fasilitas, dan sumber daya TIK di sekolah mereka, sementara yang lain tidak mengizinkan peneliti untuk melakukannya. Berdasarkan survei, berbagai fakta penting telah ditemukan. Disarankan bahwa *Teacher-Centered Learning with Technology* adalah metode yang paling tepat untuk diterapkan.

Kata Kunci: survai, pembelajaran berbasis teknologi, TIK, infrastruktur, fasilitas, sumber daya

Abstract
Purpose of this research was to gain information related to the real and perceived ICT Infrastructures, Facilities, and Resources in Bojonegara Sub District, Indonesia. This article emphasize the publication of this information because it is needed for implementation of technology-based mathematics teaching and learning. The method used was survey. Instruments of survey were questionnaires, unstructured interview guideline, and handycam. During the survey, total of 220 questionnaire packages were distributed to teachers, however only 119 (response rate 54.1%) of them were filled and returned. A total of 12 teachers were interviewed, with five of these interviews were video recorded. Several head masters welcomed and allowed researcher to visit their schools and make documentation of ICT Infrastructures, facilities, and resources, while the others did not allow the researcher to do that. Based on survey, many important findings have been discovered. It is suggested that the Teachers-Centered Learning with Technology is the most appropriate method of technology-based learning to be implemented.

Keywords: survey, technology-based learning, ICT, infrastructure, facilities, resources

INTRODUCTION

Technology is one aspect in human civilization that spreads quickly from one nation to other nations. The spreads of technology, especially information and communication technology, has influence and change human life. In the field of education, technology has been adopted as can be seen in the daily academic activities, not only in universities but also in

secondary and primary schools. Teaching and learning with technology have been happens in many places because of its benefit on provides advantage in making the process of teaching and learning more effective and efficient.

The implementation of technology-based mathematics teaching and learning requires supporting infrastructures, facilities, and resources. For that reason, the conditions of these components, called the ICTs Supported-Situation was needed for implementation of technology-based learning, have to be known. Several initiatives have been conducted to discover ICTs Supported-Situation for Teaching and Learning. The initiative were surveys of, or related to, ICT for education with reports generating recommendations, including recommendation regarding ICT for education. Examples include, The Survey of ICT and Education and country focused surveys in ten countries, Argentina, Brazil, the Philippines, Kenya, India, Morocco, Peru, Senegal, Ukraine, and Vietnam, that also provide data and information about recent ICT conditions in these developing countries, and surveys of India and seven other developing countries in South Asia, Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Pakistan, and Sri Lanka by Information and Development Program or InfoDev (2007; 2009a;2009b; 2010). The published reports of surveys or in part of survey by the World Economic Forum (2016) and International Development Research Centre (2010) also comprehensively addressed current usage of ICT. Some sections of reports briefly discussed regional and global trends of ICT in education and selected regional ICT initiatives and projects in education. In addition to the surveys several studies related to ICTs Supported-Situation and education.

However the surveys are too general to be practically used or refereed for implementation of technology-based mathematics teaching and learning. There is a need to conduct a survey in accessible area for this purpose.

Term infrastructure, facility, and resource are defined as following: Infrastructure is defined as the basic physical and organizational structures and facilities needed for the operation of a society or enterprise. Facility is defined as a place, amenity, or piece of equipment provided for a particular purpose. While Resource is defined as a stock or supply of money, materials, staff, and other assets that can be drawn on by a person or organization in order to function effectively. The implementation of technology is relevant to Fathurrohman (2012) suggestion for Addressing the need of mathematics teachers in developing countries.

Based on above definitions, researchers defined the objects of study which were needed to be known. For infrastructures were the conditions of ICT infrastructures at the area, the schools, and teachers' home. For facilities were the computer lab, computer, printer, scanner, internet connection, and handphone at schools and teachers home. For resources were digital materials, CD, DVD, and software related to it.

One important thing that needs to be considered was the perspective of teachers related to above components. In other word, not only the real condition, but also the perceived condition, based on teachers' perspective about these components was needed to be taken into account. According to Oxford Dictionaries (2011), the Real is defined as actually existing as a thing or occurring in fact; not imagined or supposed. While Perceive is defiend as become aware or conscious of (something); come to realize or understand.

| REAL		PERCEIVED	
Infrastructures	↔	Infrastructures	
Facilities	↔	Facilities	
Resources	↔	Resources	
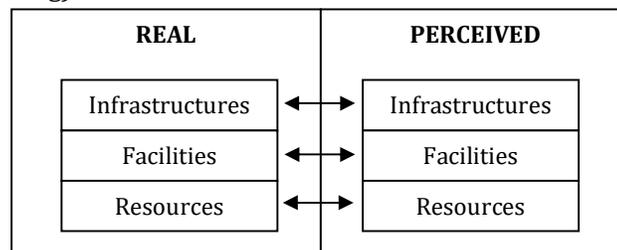
Figure 1. Objects of Survey

The knowledge related to these components would useful to select a suitable technology-based learning method. According to seminal work by Ross (1995: 24) there are five technology-based learning methods available. These methods are based on the concept of learner control.

Table 1. Matrix of technology-based learning methods

Learning Method	Center of Control	World of Work Example	Strategies
Teacher-centered learning with technology	Teachers: The teachers directs the pace and sequence	Training sessions, specific skill development	Multimedia presentation, videotape, distance instruction
Integrated learning system	Machine: A computer network and its software direct the learning	Teaching machines	Distributed ILS, lab-centered ILS
Electronic collaboration learning	Teams or partners: The teams negotiates, goals, pacing, and sequence of learning	Developmental teams, joint research efforts, learning teams	Local area networks, wide are networks, cooperative ventures
Hyperlearning	Learner: The learner is in charge of pace and sequence of learning	Research, market analysis, engineering design	Hypertext development, hypermedia development, multimedia development, network searching
Electronic learning simulations	Machine and learner: Learning is in joint control	Flight simulators, disaster control simulations, war games	Virtuality electronic simulation

The table revealed five technology-based learning methods. The table also provides what is the suitable condition to implement related method. The implementation of technology-based learning experiences requires information of current condition of real and perceived ICT infrastructures, facilities, and resources in developing countries. This article emphasize publication of this information because it is needed for implementation of technology-based mathematics teaching and learning. In order to get this information, a survey.

RESEARCH METHOD

Method of this research is survey. Survey is defined as examine and record the area and features to construct a map, plan, or description (Oxford, 2001). In this research, purpose of this survey is to examine and record the real and perceived infrastructures, facilities, and resources to construct a plan for implementation of technology-based mathematics teaching and learning. According to De Vaus (2002) there are five ethical responsibilities towards survey participants: 1) voluntary participation, 2) informed consent, 3) no harm, 4) confidentiality anonymity, and 5) privacy. The responsibilities already considered for this activities.

Population and Sample

One accessible area and of interest to the researchers was Bojonegara Sub Disctrict, Banten Province, Indonesia. Banten Province is located in Java Island, Indonesia. Respondents of of this research are registered teachers, defined as teachers who have NUPTK (Nomor Urut Pendidik dan Tenaga Kependidikan) at the start of survey. Following is the data related to respondents

Table 2. Data of registered teachers in Bojonegara Sub District, Indonesia

No	Level	Number of Schools	Number of teachers	Percentage
1	Elementary School	22	313	53.50
2	Junior High School	9	194	33.16
3	Senior High School	3	78	13.33
Total		**34**	**585**	**100.00**

To facilitate comparisons and to have a sufficiently large sample the researchers took a higher proportion from the smaller cohorts. Researchers also consider time duration and an access to schools in choosing the number of schools to sample.
Following is an estimation of the number each school type.

1. Around 1/7 of number of elementary schools teachers (1/7 x 313 = 45 teachers)
2. Around 1/5 of number of junior secondary schools teachers (1/5 x 194 = 39 teachers)
3. Around 1/2 of number of senior elementary schools teachers (1/2 x 78 = 39 teachers)

The teachers were determined based on a simple random sampling scheme within each type.

Data and Instruments

The collected data including the data related to the supporting infrastructures, facilities, and resources for implementation of technology-based learning. Moreover, because the technology-based learning also related to learning resources and learning design, the data related to these components in teaching and learning experiences also need to be collected.

Learning defined as the acquisition of knowledge or skills through study, experience, or being taught, while Design isdefined as purposes or planning that exist behind an action, fact, or object. Started from this, the following definitions are proposed. Resource is defined as a source of help or information, learning is defined as the acquisition of knowledge or skills through study, experience, or being taught, while Mathematical defined as relating to mathematics. Based on above definitions, Mathematical Learning Resources are sources of information that can be used to acquisition of knowledge or skills related to mathematics through study, experience, or being taught. In this article, Mathematical Learning Resources defined as sources of information, represented in a variety of media and format that can be used to assist student learning through study, experience, or being taught, as defined in national curricula, to acquisition of knowledge or skills related to mathematics

Learning Designs are planning that exist behind actions or facts of the process acquisition of knowledge or skill through study or experience. Term learning design is

variously defined by different authors as a process of, and for, designing learning experiences. The purposes of learning design are to documents and describe learning activity that other teachers can understand it and use it (in some way) in their own context. Specifically, Learning Design defined can be considered in two ways: (1) as a process designing learning experiences and (2) as a product, that is, the outcome or artifact of the design process (Agostinho, 2009, p. 4).

To gather data three types of instruments were used.
1. Questionnaire
   The questionnaire consists of 27 main questions. Several main questions have one or two child questions for further deep information or clarification. The topic of questions is based on focus of survey as described in Table below
2. Unstructured Guideline for Interview
   Unstructured guideline for interview constructed to follow the flow of discussion with teachers. Interview were conducted by following the flow of discussion. Sometime researcher found a new interesting topic while conducting discussion with teachers.
3. Handycam
   Handycam used to take pictures and videos related infrastructures, facilities, and resources available in the area.

For each teacher, gender, working experience, academic degree & field of study, and training in ICT was assessed in relation to ICT Condition at school & home, and the learning designs & resources they had access to or experiences. Validity of data gathered is ensured through triangulation. Three sources of data based on different instruments for one same of object are used in triangulation.

RESULTS AND DISCUSSION

Bojonegara is a Sub District of Banten Province, located in a coastal region of Java Island, Indonesia (refer Figure 3). The area, covers 30.30 km^2.
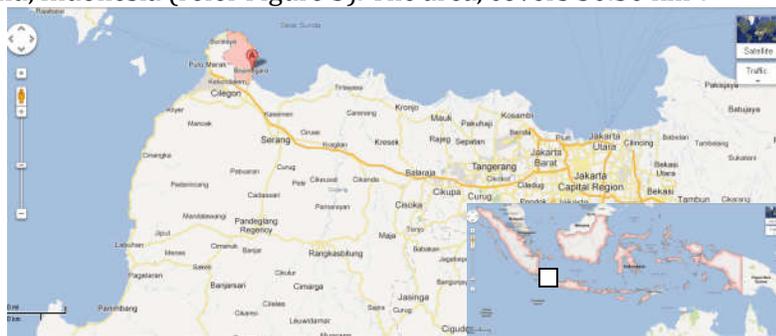
Figure 2. Location of Bojonegara Sub District, Banten Province, Indonesia

Geographically, rural areas dominate Bojonegara Sub District. However ICT technologies have penetrated the area, bring modernity to the people and the coutryside. As illustrated by photos there are many rice paddies, along with clusters of people, houses and buildings, such as government buildings and schools.

Figure 3. Survey Photos of Bojonegara Sub District, Banten Province, Indonesia

Participants

The localised study was conducted October to February years ago, with several weeks of break around the end of December and early of January. Ten headmasters welcomed and allowed the researcher to visit and document ICT infrastructure and facilities in their schools. Only two headmasters did not allow the researcher access to the school or teachers. A total of 220 questionnaire packages were distributed to teachers in elementary, junior and senior secondary school. Over the three school levels a total number of 119 teachers completed and returned the questionnaires, giving a response rate of 54 per cent.

The numbers of teachers as respondents is not exactly same as sought when the sample composition was calculated, with less responding from the elementary school and senior secondary school level, and more responding from junior secondary school level as presented in the Table 3. The variation from that intended was reasonable in terms of providing groups near 30 teachers and the responses considered viable numbers in terms of representing school ICT conditions.

Table 3. Comparison of expected number and the real number of participants

School level	Expected to Participate	Participated	Difference
Elementary School	45	41	- 4
Junior Secondary School	39	51	+ 12
Senior Secondary School	39	27	- 12
Total	123	119	- 4

The teachers were considered to be participants if they either fully or partially completed the questionnaire then returned it to the researcher. In addition, a total of 12 teachers (some of them completed questionnaire and some did not) agreed to be interviewed, with five of these interviews video recorded. At each school level the respondents are predominantly female and this is in accord with a greater proportion of teachers being female. Approximately 65 per cent of respondents were female.

The teachers' years of teaching/working experiences is presented in Table 5. Notably, approximately 80 per cent of the respondents had more than three years experience. While 43 per cent have 4 to 10 years working experiences. Indeed only 14.6 per cent of elementary teachers are in their first three years of teaching, although this increases to 20.6 per cent junior secondary and 29.6 per cent of senior secondary teachers. Based on this data, most respondents can be classified as experienced, senior teachers.

Table 4. Teachers working experiences

School Level	0-3 years		4-10 years		11-20 years		21- 30 years		>30 years		Total
	N	%	n	%	N	%	n	%	n	%	N
Elementary	6	14.6	10	24.2	7	17.1	10	24.4	8	19.5	41
Junior Secondary	8	20.5	24	61.5	6	15.4	1	2.6	0	0	39
Senior Secondary	8	29.6	12	44.4	6	22.2	0	11	1	3.7	27
Total	22	20.6	46	43.0	19	17.8	11	10.3	9	8.4	107

Since the participants surveyed and interviewed were predominantly experienced teachers, it is assumed they are more likely to know the state of ICT than the newer teachers and as such the information gathered represents the real conditions in Bojonegara Sub District. Data provided by teachers, regarding the ICT conditions in Bojonegara Sub District was considered the primary data but this was cross checked and validated by the researcher visiting and documenting (photos and video) ICT infrastructure, facilities and resources in the area and schools.

As this study is concerned with ICT, the number of teachers trained in relation to ICT was explored as this relates to teachers ICT skills. As can be seen only a very small percentage of teachers and all from the senior secondary school had been trained in the ICT field.

Table 5. Teachers experience on attending ICT related training

School Level	Never		1-2 times		3-5 times		> 5 times		Total
	N	%	n	%	N	%	N	%	N
Elementary	30	73.2	8	19.5	1	2.4	2	4.9	41
Junior Secondary	9	23.1	17	43.6	12	30.8	1	2.6	39
Senior Secondary	11	40.7	13	48.1	2	7.4	1	3.7	27
Total	50	46.7	38	35.5	15	14.0	4	3.7	107

Although the official educational background of teachers is good, their training, attending or participating in ICT related training is still low. In total only 3.7 per cent teachers have more than 5 training experiences related to ICT, and only 14 per cent of them have 3 to 5 training experiences related to ICT. This finding suggests that the teachers ICT skills may be poor. If there are many teachers in Bojonegara Sub District with good ICT skills, it would be because of their self-interest and experiences with ICT, and not because of the official training conducted by schools or the Education Office. This finding in fact can be used as a basis for recommending the Education Office conduct a number of ICT related training programs for teachers in Bojonegara Sub District, Banten Province, Indonesia.

Findings of ICTs Supported-Situation

There are various levels at which ICT conditions can be examined, in the sub district, at the school, and the home levels.

1. In the sub District

   In recent years, a substantial amount of ICT infrastructure and facilities have been developed in this region of Banten Province. Base transceiver station (BTS) towers, constructed in this region, now deliver wireless signals for hand phones and internet connection, enhancing communication both within and outside the school district.

2. At the school level

   In elementary schools, computer and related facilities are only used for administrative purposes, such as writing letters or administration reports; they are not used for teaching and learning. The equipment is supplied by the Education Office for school administration purposes not to support teaching and learning processes. All elementary schools visited during observation had TV and related electric equipment (such as CD/DVD players, refer Figure 7 for a typical set up).

In junior and senior high schools, observation revealed that 66.7 per cent of the sampled schools had one computer laboratory for teaching and learning. Teachers through the questionnaire revealed a similar percentage of schools containing at least one laboratory. Where computer laboratories are used the usage is not high. There is no computer laboratory use for teaching and learning at elementary school. Results of interview and photo documentation confirmed junior and secondary schools usually have a computer laboratory.

According to the interviews, state schools received these computers, electronic resources, and related devices from the government. Private schools receive a donation from students' parents or grants from their founders. At least until these data were collected, although there are many private companies (some of them are foreign companies and manufacturing factories) in Bojonegara Sub District, schools in this area received neither grant or benefit from these companies for ICT infrastructure, facilities, and resources. There is an opportunity for the government to encourage companies as part of their Corporate Social Responsibility (CSR) to consider giving educational grants to schools, by giving ICT facilities to schools or by providing support in the form of scholarships for poor students. CSR is mandated for good corporate governance, and should be implemented by these companies, because they are located near enough to schools and rich enough to do it.

At elementary schools, computers, printers, and other electronic equipment are only for use for administrative purposes, not for teaching and learning. Students learn in the class with conventional teaching and learning processes involving teacher instruction at the whiteboard. However at junior and secondary school, the computer laboratories are available. Although in some schools the number of computers in the computer laboratory is not more than 20 units, whereas class size is 30 to 40 students, still their condition is good and they can be used for teaching and learning. Observation indicated there was internet access (wireless) in the junior and senior high schools, and although the speed of the internet access was not good, it was still convenient to use for accessing web sites for searching and downloading learning resources from the internet. The researcher also observed one teacher accessing a

social network account during the visit using a notebook connected to the internet, a further indication of use of the internet.

Notebooks (portable computers) or projectors are available at each school level. All junior secondary teachers had access to a notebook and computer in their school, however approximately 30 per cent of teachers in elementary and senior secondary school reported that they did not have access to these notebooks and projectors. This may have happened due to limitations in the number of notebooks and projectors.

Table 6. The use of computer notebooks or projectors for teaching and learning

School Level	No		1-2 times per month		3-5 times per month		6-10 times per month		Total
	N	%	N	%	n	%	n	%	N
Elementary	29	100.0	0	0.0	0	0.0	0	0.0	29
Junior Secondary	22	71.0	5	16.1	3	9.7	1	3.2	31
Senior Secondary	24	92.3	2	7.7	0	0.0	0	0.0	26
Total	75	87.2	7	8.1	3	3.5	1	1.2	86

In terms of internet access, this facility is only available to teachers in junior and senior secondary schools. Observation confirmed this internet access with the researcher detecting the wifi signal and observing teachers connect their own notebooks to the internet using school provided connections.

Table 7. School levels and the teachers' use of internet for teaching and learning

School Level	No		1-2 times per month		3-5 times per month		6-10 times per month		Total
	N	%	N	%	N	%	n	%	N
Elementary	41	100.0	0	0.0	0	0.0	0	0.0	41
Junior Secondary	26	74.3	7	20.0	1	2.9	1	2.9	35
Senior Secondary	24	88.9	2	7.4	0	0.0	1	3.7	27
Total	91	88.3	9	8.7	1	1.0	2	1.9	103

Teachers reported using their personal mobile phone in the school for internet access. The interviews, in accord with the questionnaires also reveal that several teachers have an internet connection from their own mobile phone and frequently access the internet using them. They know that the internet is useful and they know how to use it. In addition, 18.8 per cent of teachers frequently access the internet using their mobile phones more than five times a day in the school.

Table 8. School level and number of teacher internet accesses with mobile phones

School Level	No		1-2 times per day		3-5 times per day		> 5 times per day		Total
	n	%	N	%	N	%	n	%	n
Elementary	12	85.7	2	14.3	0	0.0	0	0.0	14
Junior Secondary	1	5.9	8	47.1	1	5.9	7	41.2	17
Senior Secondary	6	35.3	6	35.3	3	17.6	2	11.8	17
Total	19	39.6	16	33.3	4	8.3	9	18.8	46

Fifty-one percent of teachers used their mobile phones to access the internet. These finding suggest that teachers are familiar with the internet, and are thus able and interested in accessing internet although they were on working days at school. With these skills and internet access at least at the high school level, it is possible that teachers could be supported to use resources on the internet for teaching and learning. The usability of ICT at schools depends upon it being maintained and serviced during technical problems that can occur during use. For this reason, there should be one or more IT staff, whether officially employed in the school or by another company, such as computer service shop. There is no IT staff at elementary schools nor did visits by IT professionals, while in total 56.1 percent teachers of junior and senior secondary staff state that IT staff is available. In junior and secondary high-school, 24.2 per cent of teachers indicated that IT staff visit only 1 or 2 times per month, while 31.8 cent stated that IT staff visit schools more than 10 times per month.

3. At the teachers' home

In contrast to the availability of technology in schools, the highest percentage of teachers who have computers at home are the elementary teachers (82.5%) with the least number of computers at home reported by junior secondary (72.2%) and then the senior secondary teacher (64%). Further results, in regard to available computer and related devices and services.

Table 9. Available computer and related devices & services

At home	Elementary		Junior Secondary		Senior Secondary	
	N	%	N	%	N	%
Computer	33	82.5	26	72.2	16	64.0
Printers & Scanners	28	70.0	20	55.6	14	56.0
Internet Access	1	2.5	13	35.1	18	30.8
Personal Website or Blog	0	0.0	2	6.5	5	20.8
Phone internet Access	6	15.0	27	79.4	12	63.2
IT assistance	27	67.5	18	52.9	18	81.8

The number of teachers who use their own computer at home for preparation of teaching and learning is low particularly for elementary teachers, 96.4 percent of whom never use the home computer for teaching and learning. Teachers' use of their own computers for teaching and learning includes the preparation of learning resources, learning designs, tasks, downloading learning materials from internet. The findings show that the teachers of senior and junior secondary schools are more familiar with the use of computer for teaching and learning than teachers in elementary schools. The use of computer is not in term of programming.

Table 10. The use of computers for teaching and learning

At home	Elementary		Junior Secondary		Senior Secondary		Total
	n	%	N	%	n	%	%
Computer							
Never	27	96.4	6	30.0	1	7.7	55.7
1-2 times per month	1	3.6	8	40.0	5	38.5	23.0
3-5 times per month	0	0.0	5	25.0	1	7.7	9.8
6-10 times per month	0	0.0	1	5.0	1	7.7	3.3
> 10 times per month	0	0.0	0	0.0	5	38.5	8.2

In accord with the questionnaire, those staff interviewed confirmed that the majority of teachers have their own computer at home. Teachers stated that their computer at home is used by their family, usually their children, for many purposes such as for playing games, watching movies, and other fun activities. The price of a set of desktop computer today, in Indonesia normally priced Rp4,500,000 to Rp9,000,000 or around $300 to $600 (all $ means Australian Dollar). Some teachers also indicated that they have a computer notebook, in Indonesia normally priced around Rp4,500,000 to Rp30,000,000 or around $300 to $2,000. This range of prices is affordable for many public servant teachers whose base annual salary for new teachers with no professional teaching experience or service is Rp28,423,200 and senior teachers with 32 years or more professional teaching experience or service is Rp65,026,000 per year. This range is lower than annual salary of teachers in some countries, for example in Australia, four-year trained teacher start on salary $59,706 and the most experienced classroom teachers earning $89,050.

For many public servant teachers in Indonesia, the prices of computer and related equipment are affordable. Approximately 20 per cent teachers bring the computer notebook to the school for their own purposes. Although the number of teachers who have printer or scanner is less than those who own computers, in total the 61.4 per cent of teachers have their own printer or scanner. Despite the large number of teachers (n=55, 61.4%), who have their own printer or scanner, only 31.8 (n=23) percent use it to support teaching and learning. These and other findings suggest there is a potential to support teachers' use of their home computer for teaching and learning.

The number of teachers who have and use internet access and phone internet access for teaching and learning is low particularly for elementary teachers who never use internet access and phone internet access for teaching and learning. Teachers' use of internet access and phone internet access for teaching and learning are for activities such as downloading learning materials from internet, searching educational articles to learn how to improve their teaching and learning. The findings show that the teachers of senior and junior secondary schools are more familiar with the use of computer for teaching and learning than teachers in elementary schools.

Twenty-one per cent of teachers, all but one secondary teacher has internet access at home. The teachers of senior and junior secondary schools are more familiar with the use of internet for teaching and learning with none of the elementary teachers using their home internet for teaching and learning purposes. Of the teachers who have the internet at home only around 25 per cent, use it for teaching and learning purposes, however it is possible that teachers can be supported to take advantage of the resources on the internet for teaching and learning. At home, 48.4 per cent of teachers access the internet using their mobile phone, and the number of them who frequently access the internet using mobile phone is also large, up to 59.1 per cent.

Only a small number (7.4%) of teachers have a personal web site or blog, however the use of personal web sites or blogs for teaching and learning is negligible. Only three teachers (15%) of those who had a blog or personal website used these for school purposes.

Table 11. IT assistance at home

At home	Elementary		Junior Secondary		Senior Secondary		Total	Total
	N	%	n	%	n	%	n	%
IT assistance								
No schedule	14	77.8	14	70.0	13	76.5	41	74.5
1-2 times per week	4	22.2	6	30.0	3	17.6	13	23.6
Everyday available	0	0.0	0	0.0	1	5.9	1	1.9

In regard to mathematical learning resources and learning designs. Teachers and students can freely use *Buku Sekolah Elektronik (BSE)* that is Electronic School Books. These electronic books are available in PDF format. There are several books that can be used by students and teachers from Class I, the first stage of formal education in Elementary Schools to Class XII, the last stage of Senior High School before university level. The Ministry of Education and Culture owns the copyright to these books and the contents are evaluated and monitored by the Ministry of Education and Culture. Teachers revealed in the interviews that they did not use them for teaching and learning. Some did not have or know about these books. Teachers might not consider the information in these books to be effective.

Several senior and junior secondary schools have their own notebooks. According to interview, teachers stated that around 20 percent of teachers in their schools bring it to the school for their own purposes. Teachers also explained that they and their fellow teachers use the internet to download educational content for use in teaching and learning. The internet is sometimes their alternative source of teaching materials as they locate many internet available resources that are useful for their teaching.

Exploring Possibilities for Mathematics Teaching and Learning

Teachers were asked about the possibility of them implementing technology-based mathematical learning resources, through the internet or online platform in their school or class. As indicated in Table, 53.1 percent of junior secondary teachers and 23.5 percent teachers of senior secondary schools believe that the implementation is possible, however all, elementary school teachers considered that the implementation of technology-based mathematical learning resources "may be possible but it would be difficult".

These results are confirmed through interview with teachers. However teachers stated that the condition of ICT in their schools is problematic when it comes to the implementation of technology-based teaching and learning. One of teachers in the interviews stated that in general many teachers have good skills and are interested in implementing technology in the teaching and learning, including the integration of the internet to improve the quality of teaching and learning, however ICT infrastructure and facilities, such as the quantity and quality of available computers for teaching and learning, the lack of sufficient supporting equipment, such as projectors, the quality of internet access, software, and financial support required would make proper implementation of technology-based teaching and learning difficult. Other teachers interviewed made similar statements.

In general teachers stated that poor ICT conditions is the main problem for the implementation of technology-based teaching and learning in Bojonegara Sub District, although they believe that the teachers have good computer skills, and are able to operate computers and other facilities for teaching and learning. The observer/researcher saw that one of the problems related to a mindset of teachers that the computers, related equipment, and internet access must be available before the implementation of technology-based teaching and learning. This meant that teachers did not try to or know how to optimize their use of the limited ICT for teaching and learning under the current ICT conditions. There were possibilities to support teaching and learning, or in general to improve the learning experiences of students using the current condition of ICT even though the ICT conditions in their school were poor.

The researcher/observer was seeking ways maximize the impact of ICT on teaching and learning given the current condition of ICT infrastructure and facilities, such as computers, the related equipment and internet access in schools and teachers' homes, to improve students' learning experiences, especially in mathematics, without having to request an additional infrastructure, facilities, and resources that would be costly for schools or government. This thinking lead to the development of tools related to the technology-based teaching and learning, appropriate to current ICT conditions, but tools that could contribute toward improving learning experiences. When examining the desire or willingness for teachers to create and share both resources and learning designs, seventy four per cent of teachers indicated that they had experienced creating or modifying learning resources. For learning designs, only 19.3 percent of teachers have tried to initiate learning designs in the classroom or school. In the case of sharing of learning resources and learning designs, as revealed in Table, 27.4 percent of teachers wish to share their own learning resources, compared to 93.3 percent of teachers who wish to share their learning design.

The researcher also asked teachers about whether they had experiences creating or modifying digital learning resources for use through the internet or online. With respect to the use of learning design, 86.4 percent of teachers stated that they wish to use other teachers mathematical learning design, with only a few teachers experienced in creating digital mathematical learning resources. Teachers also wanted to use other teachers' learning designs, with few teachers creating their own designs; therefore the circulation of a good learning design between teachers appears warranted. This finding became the foundation for the mapping learning design for circulation by one teacher to other teachers and complementing this the mapping of internet accessible learning resources for use by teachers.

The above condition is suitable for condition where teachers directs the pace and sequence. The implementation can consider result of empirical study on how the implementation of technology will contribute to students performance Fathurrohman, Porter, and Worthy (2012) This condition also supports the condition where the instruction of teaching and learning, related to presentation for in class sessions, including the target on specific skill development. Based on above discussion, it is suggested that the Teachers-Centered Learning with Technology is the most appropriate method of technology-based learning to be implemented in Bojonegara Sub District, Banten Province Indonesia

CONCLUSION

Based on the results of observation, several important findings about the physical state and teachers' awareness of ICT infrastructures, facilities, and resources were gathered. Teachers' access and use of the internet to gather educational content for use in teaching and learning has been explored. The internet is one of the sources of learning resources. Since the teachers wish to use other teachers learning designs and have little experience in creating learning designs, it is appropriate to develop tools that assist the circulation of good learning designs between teachers. Teachers-Centered Learning with Technology is the most appropriate method of technology-based learning to be implemented.

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