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The analysis of ICT needs on Chemistry learning in High School of North Aceh

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A B S T R A C T

This study aims to describe the analysis of ICT needs in chemical learning in North Aceh Regency High School. The methods used in this study use qualitative descriptive. This study was conducted at 43 high schools located in North Aceh Regency. The subjects in this study were all high school teachers in North Aceh Regency who numbered 86 teachers who taught chemistry subjects. The data collection techniques were observation, interview and questionnaire. The results showed that as many as 25 teachers (29%) did not use and utilize ICT in the learning process, this is due to the lack of facilities and infrastructure that support the availability of ICT devices such as insufficient and adequate information availability, the unavailability of adequate LCDs, the unavailability of computers/computer laboratories (computers are only available for school administration activities), and obstacles that are often experienced, namely the difficulty of internet access and Unstable electricity. A total of 21 teachers (24%) do not understand how to use ICT in learning. A total of 40 teachers (47%) already used and utilize ICT in the learning process. Such as the use of power point slides, learning videos, animated videos, the internet, email and social media.

INTRODUCTION

Technological advances have a tremendous impact on various aspects of human life including learning. The learning process, which previously relied solely on conventional interaction between teachers and students in the classroom, is currently turning into learning that can explore a variety of sources. Technological shifts, especially in the field of ICT (Information and Communication Technology) have had an influence on the world of education, especially in the learning process.

The shift in technology, especially in the field of ICT *(Information and Communication Technology)* has had an impact on the world of education, especially in the learning process. According to Azhariadi dkk (2019) with the development of technology there are five shifts that occur in the learning process, namely: 1) Training shifts to appearance. 2) Classroom shifts to anywhere and anytime 3) Paper shifts to "on line" or channel. 4) Physical facilities shift to network facilities, and 5) Cycle time shifts to real time. Information, communication, and technology in education refers to the use of communication via computers that are incorporated into the learning process in the classroom (Ghavikr & Rosdy, 2015).

The integration of ICT in education refers to the use of computer-based communication that is incorporated into the learning process in the classroom, in connection with the preparation of students for the current digital era, teachers are seen as key players in using ICT in the learning process, this is due to the ability of ICT in providing teaching and learning resources dynamic and proactive (Arsenth & Hatlevik, 2012). In addition, ICT also provides assistance and support as a complement to teachers and students, where effective learning using ICT can easily achieve learning objectives (Jorge et al, 2003).

In line with current technological developments, schools also have an important role to play in facilitating supporting devices involved in ICT-based learning, including infocus (as a tool to display teaching materials), as well as speakers to clarify the sound of the media being broadcast. Requirements analysis is a process to obtain information, models, and also specifications about the software desired by the client/user. Both parties between the client and the software developer are actively involved in this stage. The information obtained from the user is the reference for designing the software.

Chodzirin, (2016) developed description research related to the use of ICT-based learning Chemistry learning in State Senior High School 8 Semarang on reduction-oxidation materials in class X. This research showed that the application of ICT-based chemistry learning was limited due teachers' limitations in innovating to develop the learning media, although State Senior High School 8 Semarang has provided complement supporting facilities in learning process.The same study was also conducted by Zainiyati (2017) which revealed study about utilization of ICT-based learning media in local history learning. The researchers claimed that local history learning cannot give positive impact on both cognitive and affective aspects of students, so they applied this ICT-based learning media in State University of Makassar. This study showed that using ICT-based learning media was able to help students to understand the material of the Gowa Kingdom's resistance to the VOC properly and chronologically.

Budiana, *et.al* (2015), also applies ICT to mathematics learning. This study was conducted on 240 students in Junior High School 11 Jambi City. This research aims to find out the relationship between the use of ICT-based learning media tutorials with student's spatial abilities in mathematics. From this study, the researchers conclude that the use of ICT-based learning media tutorials increases the student's spatial abilities in mathematics. ICT is also used in problem-based learning implementation as done by Zakiyah (2020), which was applied in material of life cycle in science learning. In this study, the lack of teacher's creativity in teaching and a teacher-centered learning process was the problems, where ICT was expected as one of the solutions. The result showed that ICT can improve student's understanding in life cycle material

Problems that often occur in the teaching-learning process include the lack of teacher creativity in managing the classroom10, as well as teacher innovation in making learning media that still need to be improved7, and teacher-centered learning process10. The problems that are still encountered in this learning process can be overcome by ICT-based learning. Previous studies such as those conducted by Chodzirin (2016), Zainiyati (2017), and Zakiyah (2020), where ICT was proven to improve students' abilities. Chodzirin (2016), highlighted the availability of facilities and teacher readiness in implementing ICT-based learning.

Based on the problems arising in the above research, the author concluded that ICT-based learning can indeed overcome some of the problems in the teaching-learning process mentioned. However, the problem that is no less important is knowing the availability of facilities that support and the readiness of teachers in implementing ICT-based learning in the teaching-learning process, as mentioned by Chodzirin (2016) that teachers play an important role in order to educate the students.

The research conducted by Chodzirin, (2016); Zainiyati (2017), and Zakiyah, (2020) focus on improving students' understanding through the application of ICT-based learning. The goddess et.al. (2019) focuses on the readiness of teachers in the application of ICT-based learning in a school. Based on both research focuses found, the authors felt the need to know the readiness of teachers and the availability of facilities that support ICT-based learning in 43 schools in North Aceh. This is important to do for ICT-based learning so that it can be applied optimally to overcome various problems that are difficult in the teaching-learning process as mentioned above.

ICT-based learning becomes important to be applied in the teaching-learning process, considering that currently education faces disruption era Chodzirin (2016). In the disruption era, there is an inequality or instability of the conventional education system into a technology-based education system. Therefore, the readiness of teachers in creating and managing ICT-based learning media supported by the availability of supportive facilities in schools becomes important to know.

In addition, needs analysis is one of the activities that are needed in designing technology-based learning, which aims to help students learn activities and make it easier for teachers to convey learning materials and expand information about the material taught. According to Budiana, *et.al* (2015) the function of ICT in education is divided into seven functions, namely (1) As a storehouse of knowledge, (2) As a tool in the learning process, (3) As an educational facility, (4) As a standard of educational competence, (5) As an administrative support, (6) as a school management tool, and (7) As an education instructors.

In ICT engineering in the learning process, requirement analysis includes the work of determining needs or conditions that must be met in a new product (media) or product renewal (media), taking into account various needs that intersect between various stakeholders. The needs of these analyses must be implemented, measured, tested, related to the needs of the identified media, and defined to an adequate level of detail for the design of the system. This research aims to describe the analysis of ICT needs in chemical learning in North Aceh Regency High School.

METHODS

The method used in this study is a qualitative descriptive. Arikunto (2006) says that descriptive research does not use administration and control of a treatment. Descriptive research is not done to examine a particular hypothesis but only to describe the actual situation about a variable, symptom or circumstance that occurs. Sukardi (2003) suggests that descriptive research is generally conducted with the primary purpose of systematically describing the

facts and characteristics of the object or subject being examined appropriately. This study was conducted at 43 high schools located in North Aceh Regency. The subjects in this study were all high school teachers in North Aceh Regency who numbered 86 teachers who taught chemistry subjects. The data collection techniques in this study used observation and questionnaire techniques. Observation activities are carried out to see the needs of ICT in schools and how the learning process has been going on so far, while the questionnaire provided using likert scale questionnaires with 3 categories of answer options (1) never use ICT, (2) Rarely use ICT, (3) always use ICT. The results of the questionnaire are analyzed using the percentage formula (Sugiyono, 2011).

RESULTS AND DISCUSSIONS

Observation results of learning activities

The results of observations that have been conducted on August 23th to September 17th, 2021 on learning activities, especially in chemistry subjects can be seen in the **Table 1**.

Table 1. Observation results of learning activities

No.	Learning Process	Percentage (%)	
		Exist	None
1	Use the students' book	100	-
2	Use the worksheet	87	13
3	Use power point slide	70	30
4	Use the picture/animation	58	42
5	Use the video	49	51
6	Use the internet	30	70

Based on the (**Table 1**), it can be seen that not all the teachers use the ICT in learning process. In general, they still use the students' book in leaning activities. The results of observations on learning activities based on table 1 showed that the teaching and learning process takes place as in general, where as many as 100% of teachers still use students' books and as many as 87% of teachers also still use worksheet to convey the material to be taught to students, and as many as 13% of teachers who do not use worksheet in delivering learning materials. So that the learning process is still fixated on the teacher's explanation only, this will certainly have a less good impact on students' learning outcomes such as low interest in learning, students feel bored in hearing explanations from teachers, and students are also passive in the classroom.

Furthermore, it can be seen that the teachers have started to use ICT in teaching and learning process. 70% of teachers use power point and 30 of teachers have not used power point due to lack of ICT facilities at school. As many as 58% of teachers use picture/animation as media, and as many as 42% of teachers have not used picture/animation media in conveying learning materials this is due to the limitations of teachers in making learning media, especially in the creation of animation. As many as 49% of teachers use video, 30% of teachers use the internet in the learning process. While 51% of teachers do not use video and as many as 70% of teachers do not use the internet this is due to limited internet access in the school.

The utilization of ICT as mentioned earlier has a very different impact with the learning process without using ICT, this is seen from the enthusiasm of students in receiving and starting lessons, increasing student motivation in learning, students can learn independently, make it easier for students to obtain information and materials in accordance with the material that has been learned. Utilization and use of ICT in teaching and learning activities also has a positive impact on teachers, in addition to making it easier for teachers to convey the material to be taught, also helps teachers in presenting various kinds of information, especially for materials that are difficult for students to understand, the use of ICT in the learning process is also very helpful for teachers in obtaining the latest information related to the material taught. As revealed by (McCombs, 2000) teachers have confidence that teaching and learning activities will have a positive impact if they are able to utilize technology. Teachers' attitude to the willingness to use technology is a significant factor in learning activities (Kaleli-Yilmaz, 2015).

The Result of Using ICT during the Learning Process

The results of the questionnaire during the learning process can be seen on the table below:

Table 2. The result of questionnaire of ICT during the learning process

No.	Indicator	Percentage	Respondents
1	Not using ICT in learning	29%	25
2	Not understanding how to use ICT	24%	21
3	Already using and utilizing ICT in the learning process	47%	40

Based on the results of questionnaires that have been distributed to 86 teachers of chemistry subjects in North Aceh High School obtained by 25 teachers (29%) not using and utilizing ICT in the learning process, this is due to the lack of facilities and infrastructure that support the availability of ICT devices such as the unavailability of sufficient and adequate information, the unavailability of adequate LCDs, the unavailability of computers/computer laboratories *(computers are only available for administrative activities).* School, as well as obstacles that are often experienced, namely the difficulty of internet access and unstable/adequate electric current. According to Richardson, (2011) the application of ICT in learning activities can be constrained or limited by access, in Cambodia the high cost of electricity or lack of internet access becomes a major challenge to use technology in

schools. A study conducted by the European Commission (2023) found that the biggest obstacle for teachers in using ICT in the learning process is the lack of access to ICT. This access is not only the availability of technological resources but also the suitability of tools and programs to support the teaching and learning process (Tondeur, Valcke, & van Braak, 2008b). Teachers who have access to technology need resources that tend to integrate ICT into their teaching activities (Japhet & Usman, 2018). However, many studies have found that ICT resources provided by schools do not guarantee automatic use by teachers (Gulbahar, 2008b; Ertmer, 2005).

To overcome this problem, the role of the school and the government is very much needed, especially in improving school facilities and infrastructure, especially providing ICT equipment. This statement is supported by the opinion (Ensminger, 2006 & Bingimlas, 2009) which states that technology integration can only be successful if schools can ensure that they have, or can install appropriate infrastructure, and are able to incorporate a supportive environment such as adequate space, desks, room configuration, power cables, outlets, and internet service. The study conducted by Turel and Johnson (2012) revealed that technical problems were the main obstacle for teachers, these problems included low connectivity, virus attacks and printer malfunctions. This is very much different from countries such as the Netherlands, United Kingdom and Malta they have realized the importance of technical support to assist teachers in using ICT in the classroom. This is because teachers can only master wa applications and use android mobile phones, they have not been able to use other software such as not being able to use laptops/computers (operating laptops/computers), have never held and used infocus, limited knowledge about how to using technology in delivering learning materials such as making power point slides, making animations, and videos. The main cause of these teachers not using ICT in learning is also influenced by the age factor, because some of the teachers who teach chemistry subjects are between 40-50 years old. This is supported by research conducted by (Appavoo, 2020) the factors that influence the absorption of technology in teaching mathematics are influenced by the level of computer skills mastered by teachers influenced by the level of computer skills mastered by teachers and influenced by their age and experience, but computer skills also affects how often teachers use computers.

In the learning process so far they often ask for help from other people such as in terms of making power point slides, installing tools, etc. To overcome this, the school must be able to improve the performance of the teacher by holding training activities on the use of ICT in learning, training in operating software techniques, and other activities related to learning ICT tools. This is in accordance with the opinion expressed by (Aydin, Gurol, & Vanderlinde, 2016; Vitanova, Pachemska, & Pachemska, 2014; Wozney et al., 2006) which states that teacher training is one of the key factors for the success of computer integration in the learning process. In the classroom, several studies have revealed that for both novice and experienced teachers, ICT-related training programs can develop teachers' competence in using computers. In a similar study, Chen (2010) found that training was the strongest determinant of teacher use of technology in schools. ICT skills training conducted for teachers must be in accordance with their conditions, this is because not all teachers are of the same age (Ghavifekr & Rosdy, 2015). In addition, Zainiyati (2017) said that teachers also support the statement that if they involve themselves in mastering quality technology, it will have an effect for them to improve their ICT competence, they will also use and apply it in learning activities.

The use of ICT in learning activities must be in accordance with the syllabus and learning design, this aims to emphasize the delivery of information or material in accordance with the expected learning objectives. Based on the results of interviews as many as 40 teachers (47%) have used and utilized ICT in the learning process. such as the use of power point slides, learning videos, animated videos, internet, email and social media. The teacher said that the use of ICT in learning not only serves to facilitate the teacher in delivering the material but is able to create varied learning nuances so that students also more easily understand the material being taught. The materials that are often taught using power point slides, videos, and animations are atomic material, redox reactions, elemental chemistry, molecular shapes, electrochemical cells, and other chemical materials deemed appropriate to the use of ICT.

The use of ICT in learning helps the teaching and learning process directly, it is also useful for achieving several goals such as sources of knowledge, teaching and learning tools, facilities, competency standards, administrative support facilities, school management support facilities, and educational infrastructure (Faridi, 2009). Information and communication technology is defined as devices and technological resources used for communication tools, creating, disseminating, storing, and obtaining information (Jung, 2006). Good classroom management today is able to involve the use of information and communication technology (ICT/ICT) tools in teaching activities. Implementing ICT-based learning is a must for teachers. In addition, UNESCO (2011) has developed a comprehensive framework of ICT competency standards for all international teachers.

Fu (2013) also stated that using ICT provides many benefits in the world of education, namely; to assist students in accessing digital information efficiently, to

support student-centered learning and independent learning, to generate creative and collaborative learning environments, to provide more opportunities to develop critical thinking skills, to improve the quality of learning and teaching, as well as to supports teaching by facilitating access to a wide range of scientific contents.

CONCLUSIONS

Based on the results of the research above, it can be concluded that the analysis of ICT needs in SMA Aceh Utara is included in the good category, where many teachers are able to use and utilize ICT in the learning process such as power point slides, making learning videos, animated videos and using email. The readiness of the school in providing facilities and infrastructure that supports learning activities using ICT is very necessary. Although the use of ICT in learning has not been fully implemented by teachers, teachers must also be able to learn how to use and utilize software in the learning process in order to create a fun learning process and attract students' interest in learning.

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Author's Contribution

Ratna Unaida completed all the work in the field, Isna Rezkia Lukman was in charge of writing the manuscript of the research results, and Fakhrah helped to put the data of research results in the field into the table. Overall, the team of authors helped each other in completing the research until this paper can be published.

Conflict of Interest

The authors declare that they have no competing interests.

REFERENCES

Appavoo, P. (2020). Frameworks for ICT Integration in Mathematics Education - A Teacher's Perspective. EURASIA Journal of Mathematics, Science and Technology Education. 16 (6), em1845 ISSN:1305-8223.

Arnseth, H.C., & Hatlevik, O.E. (2010). Challenges in aligning pedagogical practices and pupils' competencies with the Information Society's demands: The case of Norway. In S. Mukerji & P. Triphati (Eds.), Cases on technological adaptability and transnational learning: Issues and challenges. Hershey: IGI global.

Aydin, M. K., Gurol, M., & Vanderlinde, R. (2016). Evaluating ICT integration in Turkish K-12 schools through teachers' views. Eurasia Journal of Mathematics, Science & Technology Education, 12(4), 747-766.

Arikunto, S. (2006). *Metode Penelitian Kualitatif*. Jakarta: Bumi Aksara.

Azhariadi. (2019). "Pembelajaran Berbasis Teknologi Informasi Dan Komunikasi (TIK) di Daerah Terpencil", *Makalah TIK Prosiding Seminar Nasional Pendidikan Program Pascasarjana Universitas PGRI Palembang*, 03 Mei 2019.

Bingimlas, K. A. (2009). Barriers to the successful integration if ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science and Technology Education*, 5(3), 235-245.

Budiana. (2015). Pemanfaatan Teknologi Informasi Dan Komunikasi Dalam Pembelajaran Bagi Para Guru SMPN 2 Kawali Desa Citeureup Kabupaten Ciamis. *Jurnal Aplikasi Ipteks untuk Masyarakat*. 4(1).

Chodzirin, M. (2016). Pemanfaatan Information and Communication Technology (ICT) bagi Pengembangan Guru Madrasah Sub Urban. *Jurnal Dimas*, 16 (2).

Chen, R.J. (2010). Investigating models for preservice teachers' use of technology to support student-centered learning. *Computers & Education*, 55(1), 32-42.

Ensminger, D. C. (2016). *Technology Planning in Schools. In N. Rushby, & D. W. Surry (Eds.),* The Wiley Handbook of Learning Technology (p. 461).

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? Educational Technology Research and Development, 53(4), 25-39.

Faridi, A. (2009). Inovasi Pembelajaran Bahasa Inggris Berbasis Ict Dalam Rangka Meningkatkan Mutu Pendidikan. *Lembaran Ilmu Kependidikan*, 38(1), 59–67.

Fu, Jo Shan. (2013). ICT in Education: A Critical Literature Review and Its Implications. *International Journal of Education and Development*. 9 (1): 112-125.

Ghavifekr, S., and Rosdy, W.A.W. (2015). Teaching and learning with Technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES)*, 1(2), 175-191.

Gray, L. Thomas, N. Lewis, L. (2010). *Teachers' Use of Educational Technology in US Public Schools: 2009; National Center for Education Statistics, Institute of Education Sciences*, U.S. Department of Education: Washington, DC, USA.

Gulbahar, Y. (2008). Improving the technology integration skills of prospective teachers. Through practice: A case study. The *Turkish Online Journal of Educational Technology*. 7(4), 71-81.

Japhet, E. L. & Usman A. T. (2018). Factors that influence teachers' adoption and integration of ICT in teaching/learning process. Educational Media International, 55(1), 79-105.

Jorge, C. M. H., Gutiérrez, E. R., García, E.G., Jorge M. C. A., & Díaz, M. B. (2003). Use of the ICTs and the perception of e-learning among university students: A differential perspective according to gender and degree year group. Interactive Educational Multimedia, 7, 13-28.

Jung, S.-H. (2006). The Use of Ict In Learning English As An International Language. University of Maryland, College Park.

Kaleli-Yilmaz, G. (2015). The Views of Mathematics Teachers on the Factors Affecting the Integration of Technology in Mathematics Courses. Australian Journal of Teacher Education, 40(8).

McCombs, B.L. (2000). Assessing the Role of Educational Technology in the Teaching and Learning Process: a learner-centered perspective. Paper presented at Secretary's Conference on Educational Technology: measuring the

impacts and shaping the future, Washington, DC, 11-12 September. ERIC Document Reproduction Service, ED 452 830

Richardson, J.W. (2011). Challenges of adopting the use of technology in less developed countries: the case of Cambodia. Comparative Education Review. 55(1), 008-029.

Sugiyono. (2011). *Metode Penelitian Kuantitatif Kualitatif dan R&D.* Jakarta: Alfabeta.

Sukardi. (2003). *Metodologi Penelitian Pendidikan Kompetensi dan Prakteknya*. Jakarta: Bumi Aksara.

Türel, Y. K., & Johnson, T. E. (2012). Teachers' Belief and Use of Interactive Whiteboards for Teaching and Learning. Educational Technology & Society, 15(1), 381–394.

UNESCO. (2011). *ICT Framework for Teachers, France: United Nations Educational, Scientific and Cultural Organization*.

Vitanova, V., Pachemska, T.A., & Pachemska, S. (2014). Factors affecting the frequency of ICT usage in primary schools teaching. *The Eurasia Proceedings of Educational & Social Sciences*, (1). 461-468.

Wozney, L., Venkatesh, V., & Abrami, P. (2006). Implementing computer technologies: Teachers' perceptions and practices. *Journal of Technology and Teacher Education*, 14(1), 173-207.

Zainiyati, Husniyatus Salamah. (2017). *Pengembangan Media Pembelajaran Berbasis ICT Konsep dan Aplikasi pada Pembelajaran PAI*. Jakarta: Kencana.

Zakiyah, Ani Muzarotul. (2020). Model pembelajaran PBL *(problem-based learning)* pada mata pelajaran IPA materi siklus hidup beberapa jenis hewan pada kelas 4 SD. Bachelor (S1) *Thesis,* Wijaya Kusuma Surabaya University.