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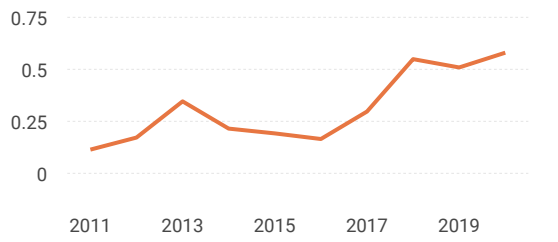


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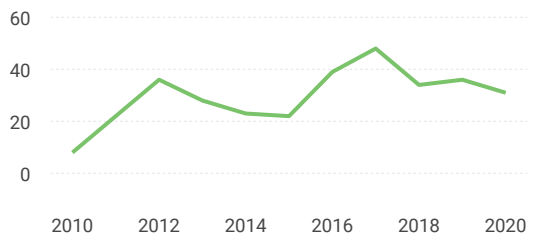


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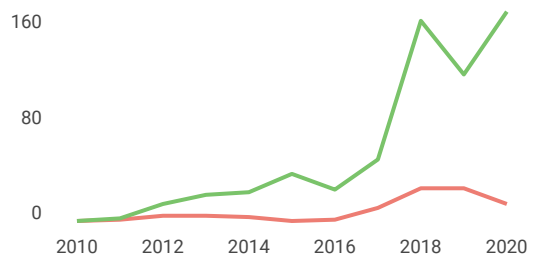


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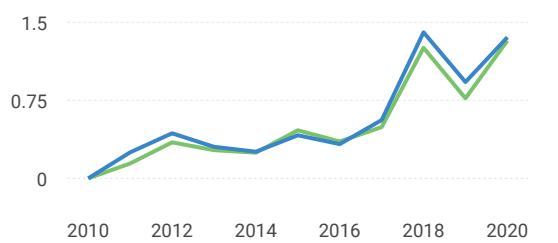


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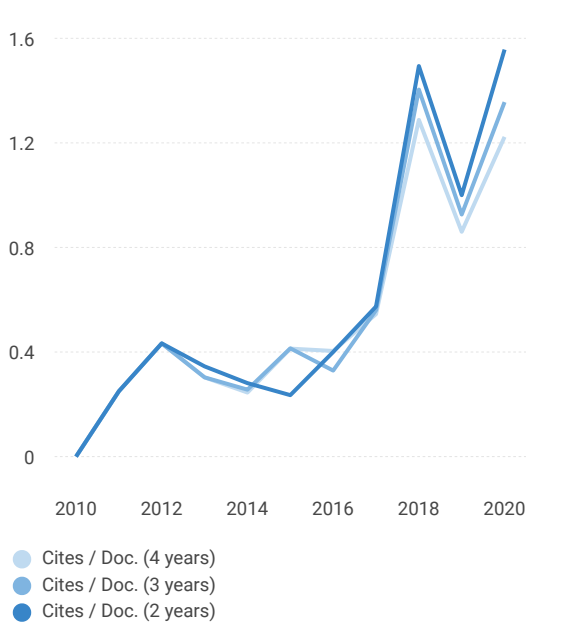

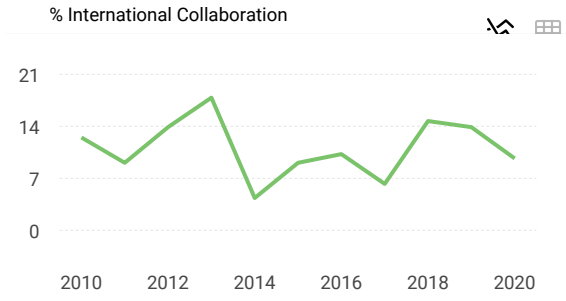


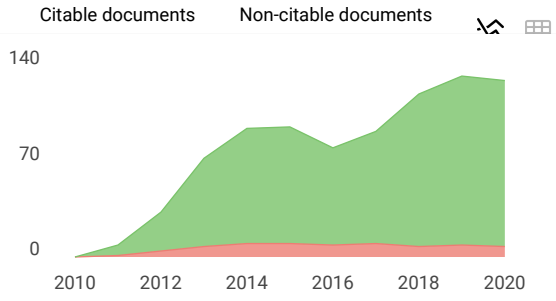


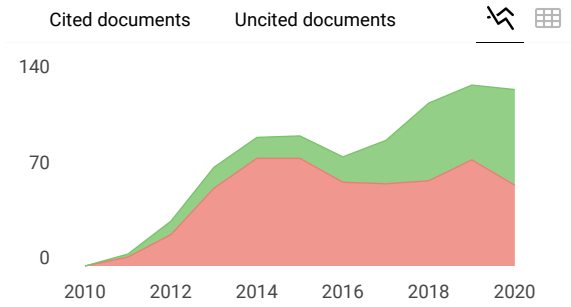




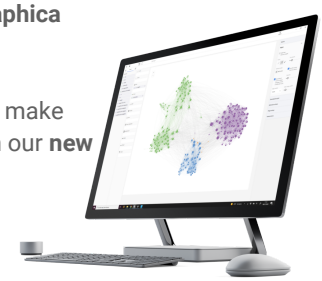

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1. Solar Cell as its power
2. LED lamp for fishermsn vessel
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The Strategy of Simulation of Powered LED Lamp System (Solar Cell Diesel Engine) to Traditional Fishing
Vessels in Makassar

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Abstract

This paper deals with explaining the importance of higher education research that is directed to the design the strategy of simulation of powered LED lamp system solar cell in future fishing vessels. The principal aim of this research is the utilization of renewable energy with the use of solar cell technology as a driver of lux system on fishing vessels. This research was a panel solar cell yields its power is 100 WP. It is applied to implement LED lamp with its power 100 WP. This wind energy is environmentally (clean energy), economically (cheapest), easy to operate and easy to maintain, also renewable energy. The method of analysis is quantitative approach using one way classification (analysis of variance or design of experiments). The finding of this research is accepted the null hypothesis or not differ significantly at 5% from each independent variable. The scenario and the parameters during the strategy simulation powered LED, solar cell as a power generated by The Fcount is higher than Ftable (3635,27 > 5,77), so H0 is rejected, it means at least there is one light intensity mean value that is produced by the different sun panel significantly on the real stage of 5%. So that the obtained LED lamp system at Paotere fishermen vessels in Makassar. It is expected to encourage and motivate the fisherman public in developing and applying this technology, so that it can upgrade the fish production quality and increase the economic value of fishermen society.

Keywords: Power LED; Renewable Energy, solar cell, enlighten, economic value.

## I. Introduction

In Indonesia, industry Energy has an important role in the attainment of social, economic, and environmental goals for sustainable development, and is a supporter of national economic activities. The usage of energy in Indonesia is increasing rapidly in line with the economic growth and resident increase; to fulfill requirement of energy that is increasing, develop various kinds of alternative energies, including renewable energy (solar cell), which until now has not been widely exploited.

Solar cell is one of the energies currently being developed today by the Government of Indone-sia because as tropical state, the solar energy potency is big enough. Based on irradiation, data of the sun mustered out of 18 locations in Indonesia, solar radia-tion in Indonesia can be classified as follows: for occi-dental area and Eastern Indonesia with distribution of irradiation in KBI around 4.5 kwh/m2/day with month-ly variation about 10%; and in KTI around 5.1 kwh/m2/day with a monthly variation of about 9%.

Fishery potency of deconvolution in Indonesia spreads over all part of water territories of the Indonesia Sea such as in territorial sea waters, marine waters of the archipelago and marine waters Exclusive Economic Zone (ZEE). The width of water territory of Indonesia sea is estimated 5.8 million km2 with the longest coastline in world of 81,000 km and islands bunch of 17.508, having fish potency estimated at 6.26 million tons/year which can be managed everlastingly with details of 4.4 million tons can be caught in water territory of Indonesia and 1.86 million obtainable tons from water territory ZEEI.

The problems of traditional fisherman, especially fieldsman, still use hold with ice block

media as haul fish preservative media. Besides applying big cost, it also requires big storage space. While on the ship itself, it is very possible to install solar panels on the roof. So it enables scheme and making of hybrid power refrigerator. Energy yielded by solar cell hardly depends on weather and absorption time of energy which only happened in the day time. Therefore, it is necessary to conduct hybrid power research (solar cell diesel engine) as energy for refrigerator on traditional fisherman ship (Ariawan, 2008).

II. LITERATURE REVIEW

2.1 SEER Base

The Sun Energy Electric Revival (SEER) is the revival that uses the sunshine as the electric producer source. The main tool is to catch, change and result the electric is Photovoltaic (PV) or it is generally called Module/Panel Solar Cell. By PV, sun shine is changed into the negative and positive electron flowing process in PV because of the electron difference. The result of these electron flowing is the direct current electric energy that can be used to fill the battery/accumulator according to the needed tension and ampere (Figure 2.1).
The set capacity total in the sun energy conversion nowadays is less than 0,008 GW (8 MW). The national sun energy reached 4,8 kWh/m2/day (Table 1.1 and www.anekasurya.com).. The advantage of SEER can be de-veloped in the isolated region, especially in the unreachable region by the electric net/ state electric revival, hospitality envi-ronment, cheap operation cost and treatment.
The electric energy cost per kWh by using the earth heat energy is USD 0,08 (Rp. 800) and the electric selling price by PT PLN is USD 0,06 or around Rp. 650 per kWh. The electric energy cost per kWh for electric revival using motor fuel is USD 0,12 (Rp. 1.200). The coal usage is cheap, but it produce the high pollution and emission.
2.1.1. SEER main component

Several SEER main components are as follows :

1.Solar Panel

2.Solar Charge Controller

3.Battery

4.Inverter.

2.1.2. Solar Cell Panel

Figure 2.1. Solar Cell energy (Sumber: http://www.energi- ku.com/2016/04/modal-rp2-juta-rumah-anda-bisa-dapat.html).

Figure 2.2. The kind of Solar Cell Panel.

2.1.3. The Difference Between Polycrystalline and Mono-crystalline

Table 2.1 Explains about the difference between polycrystalline and monocrystalline.
Table 2.1. The Difference between Polycrystalline and Monocrystalline

No.

Criteria
Polycrystalline
Monocrystalline
1 Making Process
Simple Pure single silicone crystal
made with the process of czochralsky, com-plicated and expen-sive process
2 Price Cheap Expensive
3 Heat Effect Low Temperature coefficient, power
reducing on every high tem-perature increasing High Temperature coeffi-cient, power
reducing on every high temperature in-creasing

4 Efficiency Low High
5 Dimensi-on/measurement Big Small

1 4

2
3
Figure Explanation: Figure 2.3. Scheme of SEER

1. Panel solar cell; 2. Battery; 3. Burden; 4. Solar Charge Con-troller (SCC).

2.1.4. Solar Charge Controller

Solar Charge Controller (SCC) is the tool that func-tions changing DC solar panel tool into DC battery tension, and regulate the energy filling from solar panel to battery and regulate the energy usage from battery to the burden.

2.1.5. Battery

Battery is the tool to save the energy. The kind of battery nowadays is used for the need of SEER is AGM battery, Deep Cycle VRLA, GEL Battery, and Lithium. While the kind of battery based on the electric tension, that often used on SEER is: battery with the tension 12 V and 24 V.

2.1.6. Inverter

Inverter is the tool that functions to change from DC tension into AC tension (figure 2.4 and 2.5).

figure 2.4. Battery, inverter and burden.

2.2 Formulas that are used
Several formulas that used in the designation accounting of SEER are

2.1.1 The power sum (P) that produced can be counted with the formula are as follows: P = V

* I
where:

P = is power [watt] or [W]
V= is tension [volt] or [V]
I = is current [ampere] or [A].

2.3. The Definition of Project Based Learning

Project Based Learning (PBL) is the learning modern that have been developed in the progress countries as the United States. If it is translated into Indonesian, Project Based Learning means as the learning based project.
The learning based project (PBL) is the learning method that used the problem as the early step in collecting and integrating the new knowledge based its experience and real activity. PBL is designed to be used in the complex problem that needed learning in do investigation and understand it.

2.4. Simulation

Simulation is an imitation process from something that is real and its state of affairs. The action of conducting this simulation describes the key characteristic qualities from the physical system behavior or certain abstract system (http://artikata.com/arti-351211-simulasi.html).

RESEARCH METHOD
3.1. Research Design

This research design is conducted with the step such as flow diagram :

Figure 3.1. Flow Diagram of Research activity.

3.2. Approach Method

This research used the quantitative and qualitative ap-proaches by referring the teaching method based on project (PBL).

3.3. The kind of research

The kind of research that is conducted is the exper-imental design.

3.4. Place

This research is conducted in the department of Me-chanical Engineering in the State University of Makassar.

3.5. Population and Sample

3.5.1 Population

The sun panel laboratory design with the power of 100 WP.

3.5.2 Sample

The research subjects of the sun panel laboratory of 100 WP are the students of Semester IV of Thermodynamics lecturer sub-ject participants of Technique and Heat Transfer

3.5.3 Research Instrument

The research instruments that used are as follows:

1. Score of Thermodynamics with Conventional Method.

2. Score of Thermodynamics lecturer subject with PBL method.

3.5.4 Research Data

Data is taken from observation result by digital multi-tester measurement tool.

3.5.5 Data Collecting Technique

Data collecting technique are by,

1. Taken data is the primary data (from measurement result).

2. Experimental Test.

3.6. Analysis

Analysis is conducted by using experimental design of factorial experimental design (Miller, I, 1985: 389) with math-ematics model are as follows:

RESULT AND DISCUSSION

4. Testing measurement tool

Flow Diagram (Figure 4.1) of research that been conducted and light intensity measurement

Figure 4.1. Flow Diagram of Measurement light intensity

4.1. Research result data

There are several this chapter describe that::

1. Measurement and tools

2. Measurement procedure

3. Research result

4.1.1. Measurement and tools

Figure 4.2 The light intensity tools lamp that have been seen and time measured with the used light sensor.

Figure 4.2. Light sensor (for measuring light intensity)

Figure 4.3 LED lamp at several time “on”

Figure 4.3. LED lamp at several time “on”

Figure 4.4 measurement of light intensity LED lamp that have been seen by the used tools light intensity lamp light sensor with the used lux.

Figure 4.4. Collecting data light intensity with used light sensor

4.1.2. Measurement procedure

Figure 4.5. solar cell energy flow diagram of measurement that have been seen.

Figure 4.5. solar cell energy measurement flow diagram

Figure 4.6. solar cell energy at fisherman vessel.

Figure 4.7. Solar cell energy at fisherman vessel.

Figure 4.8. Solar cell energy measurement at fisherman vessel.

4.1.3. Measurement result data

Data result of light intensity of Makassar Fishermen Vessel at Table 4.1.

Table 4.1. Time duration and light intensity [lux]:

Replication Light Intensity Measurement at Noon
07.00 a.m 12.00 a.m 14.00 p.m 18.00 p.m
1 140 250 238 227
2 138 221 230 223
3 138 205 228 211
4 130 194 223 209
5 129 185 213 196
6 122 182 190 179
7 177 182 179 151

8 162 180 168 143
9 124 178 133 134
10 110 172 121 117

Note: The primary data that had been managed

4.2. Counting Stage

Data management (Table 4.1) is done by using analysis of variance with one way classification By using the equation, the counting and recapitulation is done on table 4.2 and 4.3. With the following working stages :

1. H0 : μ1 = μ2 = μ3

2. H1 : at least two different medians

3. α = 5%

4. Critical region: f > 2,87

5. Counting

a. See Table 4.1 till. 4.3.

b. See the equation of 3.2 till 3.6 and Table 3.2.

6. Conclusion: Because fcount (5%,3,37) is higher than ftable(5%,3,37), so zero hypothesis is rejected, it means that the time difference against the light intensity mean is on the real stage of 5%.

4.3. Data Management

Data management is done by using the equation and Table 4.1 and is gained as follows: This counting result is reported on Table 4.3.

Table 4.3. Analysis of Variance.

Source of variation Df SS MS Fratio Ftable
Treatments 3 21,527.40 7,175.80 6.68 2.87
Error 36 38,685.00 1,074.58
Total 39 60,212.40

Irwin Miller, 1985:332-341
Irwin Miller, 1985:332-341
Charles R Hicks, 1983:388

From Table 4.3, it can be concluded that because Fcount is higher than Ftable (6,68 > 2,87), so H0 is rejected, it means that at least, there is one light intensity mean that had been produced by the significantly different sun panel on the real stage of 5%.
The counting is continued to analyze the difference by using Newman-Keuls range test (Charles R Hicks, 1983: 51).

4.6. Newman-Keuls Range Test Procedure

Table 4.4. One way ano-va

Source Dk Quadrat
Sum Middle Quadrat Fcount Ftable
Inter treatment 4 1399,276 349,81912 3635,9027 5,77
Galat 24 2,405311 0,0962125
Total 29 1401,682

Conclusion: Because fcount is higher than ftable (3635,9027 > 5,77), so the zero hypothesis is rejected (Table 4.4), it means at least – there is one significantly different wind velocity mean value against the electric power of KASV on the real stage of 5%.
The counting is continued to analyze the difference by using Newman-Keuls range test (Charles R Hicks, 1983: 51-54).

4.7. Project Based Learning

PBL is comprehensive approach for teaching and learning that is designed so the learners do the research against the real problem. Where the educated participants in the complex problems, real world problems, wherever the educated participants can choose and decide the meaningful problem. The educated participants are given chance to practice various skills that are needed for their adult life and career (how to allocate time, how to be responsible individual, private skill and learn through experience or experimentation).

Figure 4.9. Teaching Aids Making

Figure 4.8. shows that the teaching aids making by using PBL way .

5. Counting Stage on Newman-Keuls Range Test

The stages on Newman-Keuls range test are as follows.:

1. Arrange and put in order the mean and treatment as follows:

k = 5 mean 6,958 7,35 13,989 21,177 23,467

treatment V1(4,5) V2 (4,7) V3 (5,0) V4 (5,1) V5 (5,2)

2. From Table 5.5 ratio value is 0,0962125 with dk (freedom degree) is 25.

3. Count Standard Error of a Mean sy.j0,0962125
sy.j = = 0,0192
5

4. From Table E1 Charles R Hicks, 1983: 390 (The Signifi-cant Ranges, for n2 = 25 is gain:
p: 2 3 4 5

Ranges: 2,915 3,525 3,895 4,165

5. Count LSR (Least Significant Ranges) as follows.:

p: 2 3 4 5
Ranges:

LSR: 0,056

(0,0192*2,915) 0,0678 0,0749 0,0801

6. Compare:

a. The highest with the lowest Power5 vs Power1, (23,467 – 6,958)

= 16,509 > 0,0801
b. The highest with the lowest II Power 5 vs Power2, (23,467 – 7,35)
= 16,117 > 0,0749

c. The highest with the lowest III Power5 vs Power3, (23,467 – 13,989)
= 9,479 > 0,0678

d. The highest with the lowest II Power5 vs Power4, (23,467 – 21,177)
= 2,291 > 0,056

e. The highest II with the lowest Power4 vs Power1, (21,177 – 6,958)
= 14,218 > 0,0749

f. The highest II with the lowest II Power4 vs Power2, (21,177
= 13,827 > 0,0678

g. The highest II with the lowest III Power4 vs Power3, (21,177 – 13,989)
= 7,188 > 0,056

h. The lowest III with the lowest Power3 vs Power1, (13,989 – 6,958)
= 7,03 > 0,0678

i. The lowest III with the lowest II Power3 vs Power2, (13,989 – 7,35)
= 6,639 > 0,056

j. The lowest II with the lowest Power2 vs Power1, (7,35 – 6,958)
= 0,392 > 0,056

k. From the six steps (a till. j) is got:

a. Power5 is different significantly with Power1. b. Power5 is different significantly with Power 2. c. Power5 is different significantly with Power 3. d. Power5 is different significantly with Power 4. e. Power4 is different significantly with Power 1. f. Power 4 is different significantly with Power 2. g. Power 4 is different significantly with Power 3. h. Power 3 is different significantly with Power 1. i. Power 3 is different significantly with Power2. j. Power2 is different significantly with Power 1.
So it can be concluded that there are difference of mean influence each wind velocity against the power that is produced by KASV of NACA 4412 type on the real stage of 5%.
Or it can be figured as follows.:

Treatment Power5 Power4 Power3 Power2 Power1

mean 23,467 21,177 13,989 7,35 6,958

The other positive impact of solar cell energy usage is LED lamp glow when the state electric company doesn't work (turn off)

Figure 4.9 and 4.10 shows one of the electric flow benefits that are used for the street lightening keep working when the State Electric Company doesn't work (turn off).

5. CONCLUSION AND SUGGESTION
5.1. Conclusion

The conclusion sare as follows.:

1. Because Fcount is higher than Ftable (3635,9027 > 5,77), so H0 is rejected, it means there is one significantly sun panel light intensity on the real stage of 5%.

2. The highest sun panel light intensity value of LED are (23,467 and 7,35 lux).
3. The stage that is done for PBL are socialization, practice of teaching aids making, teaching aids trial, participate in the competition and practice of PBL in the classroom and finally get gift as the first winner on the energy field on the Innovation and Technology competition (INOTEK) of 2017 that is hold by Malang city government and is participated on the national exhibition.
4. The F ratio is higher than F table. It means the zero hypoth-esis is accepted or is not different significantly at 5% from each inde- pendent variable. (3635,9027 > 5,77), so zero hypothesis is rejected (Table 5.5), it means at least – there is one significantly different wind velocity mean value against the electric power mean of KASV on the real stage of 5%.

5.2. Suggestion

Some suggestions that need to be uttered for the next research are as follows :
1. The additional effort of watt peak on the sun pane-that is expected in order to increase the light intensity and operation time
2. The additional effort of the additional tool on the sun panel that is expected can increase the light intensity.
3. The way and practicing of PBL need to be socialized in front of the student.

Acknowledgment

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ABSTRACT: Digital competence is a promising skill to be learned in this ICT era. However, teaching such skill is not a trivial task, especially when the students are not ICT-aware. In this article, the authors consider the ICT awareness of high school students in Indonesia. According to this study that involved 113 respondents at the beginning of August 2018, most students are aware of the existence of ICT and they frequently interact with ICT devices or services. Further, they are familiar with at least one ICT application or skill. In conclusion, high school students have a considerable amount of ICT awareness. Digital competence can, therefore be taught to them with ease.

Keywords: ICT awareness, digital competence, computing education, k-12 education

## INTRODUCTION

Information and communication technology (ICT) significantly alters our daily life [1]. In the past, for example, one often relied on the postman to communicate with people in remote areas. Nowadays, one can simply use an e-mail service, which is far cheaper and faster. Another significant impact occurs in the learning process. One was used to learning with physical books and attend on-site classes to learn things. Now, one can just simply read softcopy books (which are accessible through the Internet) and learn remotely through educational tools.

The significant impact of ICT draws a lot of attention in both industry and academia. From the industry perspective, the impact of ICT is argued to affect output growth in the economy [2] and skill demand [3]. In academia, on the other hand, ICT is argued to provide learning alternatives (such as self-learning through educational tools [4] or distance learning [5]), even though those alternatives are only beneficial when academia is adaptive to it [6].

Considering the crucial role ICT plays in human life, it starts to be taught to school students. Some related research works are reported to focus on three school actors: students (or learners), teachers and stakeholders (or school leaders). Student-focused research is mainly focused on how to provide more convenient learning mechanisms with ICT. For instance, in the work carried out by Bilyalova ICT was implemented in learning foreign languages [7]. Another two examples are about collecting the student perspective on the use of non-academic ICT for academic performance [8] and combining ICT and gamification in learning [9].

From the teachers' point of view, research work is more focused on how to facilitate and encourage teachers to integrate ICT in their teaching. Revilla Muñoz et al proposed a mechanism to reduce teachers' techno-anxiety by improving their ICT problem-solving skills [10]. Work by Rao et al summarised the differences in ICT usage among teachers (so that ICT usage guideline for teachers can be further extracted) [11]. Other research shows the evaluation of the impact of ICT (which could be used to convince the teachers about the benefits of ICT and to encourage them to apply it in their own teaching) [12-14].

Despite them not being directly related to the teaching process, stakeholders (or school leaders) are still important in integrating ICT at schools. The summary of school leaders' perspective about ICT usage can be seen in work by Blau

and Shamir-Inbal [15]. In addition to facilitating the teaching process, ICT can also be used as a medium to mitigate the gap between high schools and universities [16].

The advance of ICT does not only affect teaching process in schools and universities, but it also forces them to teach their students about digital competence. According to Hatlevik et al, digital competence refers to the skills, knowledge and attitudes that make learners use digital media for participation, work and problem solving in a critical, responsible, and creative manner [17]. However, teaching digital competence is not a trivial task since it depends heavily on students' prior knowledge about ICT. If the students are aware of the existence of such things, it will be easier to teach digital competence. Otherwise, more advanced teaching methods should be incorporated.

This article reports on the ICT awareness of high school students in Indonesia, involving 113 respondents. In general, three research questions are proposed: 1) how aware are the students of ICT?; 2) how frequently do the students interact with ICT?; and 3) how many ICT applications (or skills) have the students been familiarised with? Findings resulting from this study are expected to support teaching digital competence in Indonesia, especially at the undergraduate level (which is the successive level of high school). Further, from the university stakeholder perspective, those findings can also be used for reaching the right market or proposing more suitable academic curricula.

## METHODOLOGY

To measure high school students' awareness about ICT, a questionnaire containing nine questions was proposed (see Table 1 for the details). The first two questions (i.e. S1 and S2) are related to how aware the students are of ICT. S1 asks about whether they are aware that ICT is inseparable from daily life; whereas S2 asks whether ICT is an attractive field to be learned (with an assumption that such interest is also affected by student awareness about ICT impact). Those questions should be answered in a 4-point Likert scale, where 1 refers to strongly disagree and 4 refers to strongly agree.

Table 1: Survey questions.

| ID | Question |
|---|---|
| S1 | Do you agree that your daily life is inseparable from ICT? |
| S2 | Do you agree that ICT is an attractive field to be learned? |
| S3 | How many hours do you spend (on average) for interacting with computer? |
| S4 | How many hours do you spend (on average) for interacting with smartphone? |
| S5 | How many hours do you spend (on average) for interacting with Internet? |
| S6 | How many hours do you spend (on average) for interacting with computer or smartphone games? |
| S7 | Which social media platforms are you familiar with? |
| S8 | Which ICT skills are you familiar with? |
| S9 | Which programming languages are you familiar with? |

The following four questions (i.e. S3 to S6) are about how frequently the students interact with ICT. For each question, it should be answered with a non-negative integer describing how many hours are involved on given interaction. Four ICT devices and services are considered: computer (or laptop), smartphone, Internet and electronic games played from either computer or smartphone. Those devices and services are assigned to S3-S6, respectively.

The last three questions (i.e. S7 to S9) refer to how many ICT applications and skills, which the students have become familiarised with. These questions are formed as multiple-answer questions, where students can provide more than one answer from the options provided (see Table 2 for the options for each question). Further, they can also add their own-defined option or provide no answers, if necessary. S7 is about social media platforms, whereas S8 and S9 are about ICT skills and programming languages, respectively. Here, it is assumed that using more of those aspects will correspond to higher ICT awareness.

Table 2: Predefined options for S7-S9.

| Question ID | Options |
|---|---|
| S7 | Facebook, Instagram, Line, Telegram, Twitter, WhatsApp |
| S8 | Computer network, document processing, image editing, programming, video editing, 2D/3D modelling |
| S9 | C#, C++, Java, HTML/JavaScript, Kotlin, Pascal, PHP, Python |

The questionnaire was written in digital format through Google form and distributed to high school students at a private school in Indonesia. On the survey form, it was stated that by filling the survey they agreed for their data to be used for research purposes. However, for privacy reasons, it was also stated that their personal information would be anonymised. To make the students aware about the survey, the authors had asked the school to provide them a short period of time at the end of class session at the beginning of August 2018. This short session was used to explain the survey and asked the students to fill the form through their own smartphone. As the result of our survey, 113 responses were collected.

According to Figure 1, S1 and S2 are agreed (or strongly agreed) by more than 85% respondents. In other words, the students are aware that ICT is inseparable from their daily life, and it is an attractive field to be learned. Those findings are strengthened by the fact that only up to 10% of respondents who disagree or strongly disagree with those statements. When compared to each other, S1 is strongly agreed by more respondents than S2. Hence, it can be stated that some students are completely aware that ICT and their daily life are inseparable, but it does not mean that they want to learn it further. Such a finding is natural since some people prefer to become users rather than the developers.

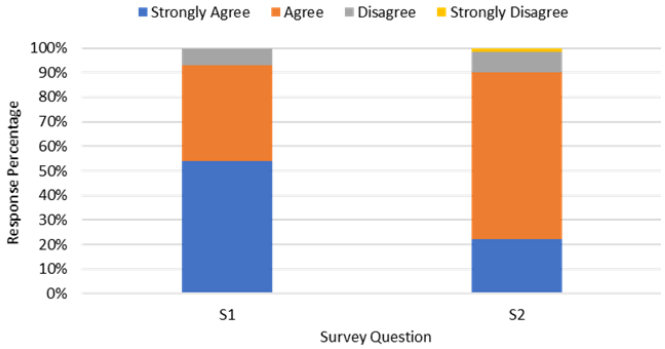


Figure 1: Survey result regarding how aware the students are of ICT (Students views on ICT awareness).

In terms of how frequently the respondents interact with ICT, Figure 2 shows that the Internet (that is stated in S5) is that ICT devices or services are the most frequently interacted with. On average, respondents spend about nine hours a day being connected with it. Such high frequency is then followed by the use of smartphones, for which the average is about six hours (see S4). Computers (in S3) and electronic games (in S6) are the services least frequently interacted with. The respondents spend only about two hours per day to access each of them. It is important to note that the ICT services and devices discussed here may intersect with each other. For example, it is possible that some students interact with laptops and the Internet at the same time.

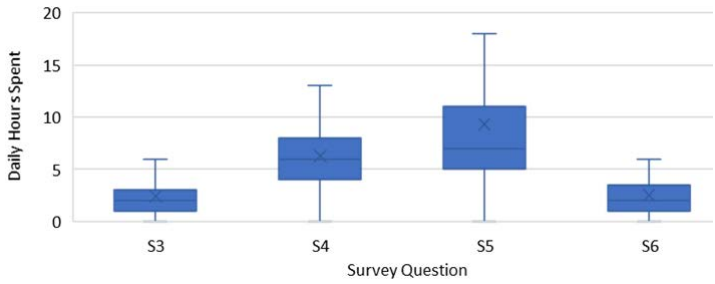


Figure 2: Survey result regarding how frequently the student interact with ICT (Daily hours of interaction with ICT devices and services).

Few respondents answered S3 to S6 survey questions with zero (meaning they have no interaction with given ICT devices and services). According to this survey, the proportion of such respondents are only about 9%, 4%, 4% and 19%, respectively. It is important to note that the largest proportion occurs in S6. In other words, it can be stated that electronic games are not as popular as other ICT devices and services in terms of engaging human interaction. The respondents have become familiarised with several ICT applications and skills. Figure 3 depicts that, on average, they are used with three social media applications, three ICT skills, and one programming language. It is natural that when compared to other ICT applications and skills, programming languages is the one least familiar to users; it is only known by students who want to learn ICT further.

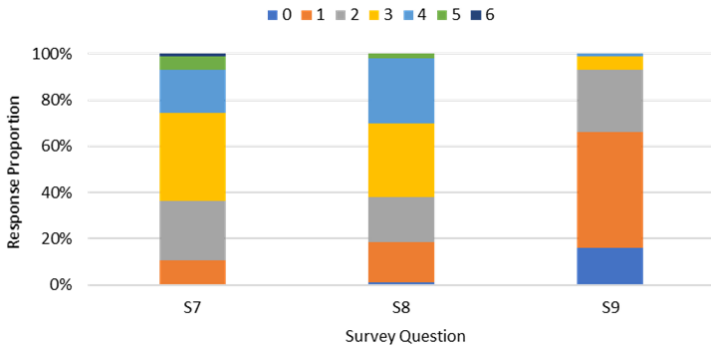


Figure 3: Survey result regarding how many ICT applications and skills, the students have been familiarised with.

Through further observation towards the S7-S9 result, it is interesting to see that all respondents have at least one social media platform, 99% of respondents were familiar with at least one ICT skill, and 84% of respondents know at least one programming language. Most (if not all) high school students have familiarised themselves with ICT applications and skills.

Among the social media applications surveyed, Instagram is the most familiar one among respondents. As shown in Figure 4, it was selected by 94% respondents. Such high popularity is then followed by Line (91%), WhatsApp (58%), Facebook (13%) and Twitter (13%), respectively. It is important to note that other social media applications besides the aforementioned ones were also selected. Some of them are Snapchat, Telegram and Kakao Talk. They are merged as others (18%) in Figure 4. From the university marketing division perspective, this finding can be used to reach prospective students in Indonesia. They can focus their advertisements on Instagram and Line instead of other social media.

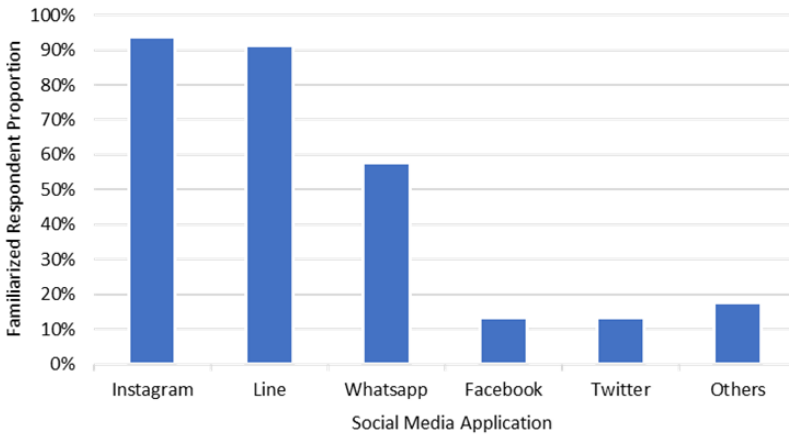


Figure 4: S7 result: familiarised social media applications.

When perceived from familiarised ICT skills, Figure 5 shows that programming is the most familiar one. It has been learned by 84% respondents. Further observation shows that such high popularity is supported by the fact that most schools teach programming as a part of their curricula due to ICT integration at schools.

Document processing (e.g. manipulating Word files, Excel files and presentation slides) is ranked second. It was selected by 82% respondents as one of their familiarised ICT skills. Such skill is then followed by image editing and 2D/3D modelling, respectively. Others refer to ICT skills other than the aforementioned ones. It includes computer networks (such as integrating LAN) or video editing. According to the S8 result, ICT skills other than programming, document processing and image editing should be taught in a more comprehensive way at the university level; prospective students may not be familiar with them.

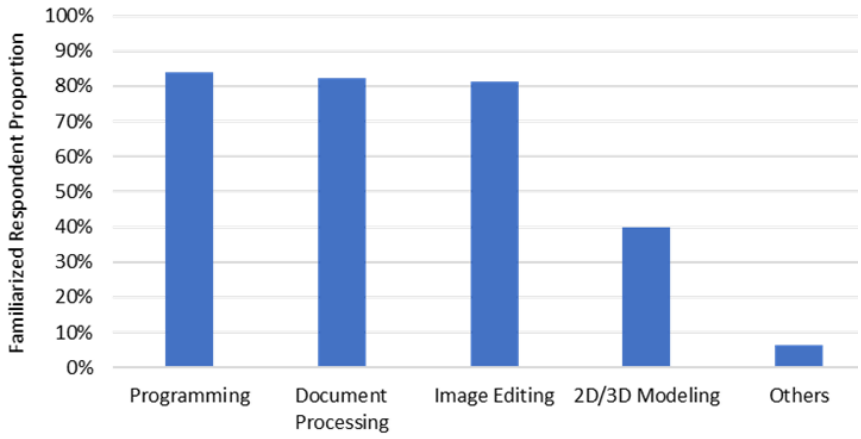


Figure 5: S8 result: familiarised ICT skills.

Figure 6 shows that HTML/JavaScript is the most familiar programming language. Further observation shows that students are familiar with it as it is often taught at schools. HTML/JavaScript is easy to use (compared to other stricter languages, such as Java and C#) yet its result is representative (since it involves a lot of visual components).

According to this finding, if some universities plan to teach their students programming languages, it would be better to teach them from the HTML/JavaScript perspective since they have learned such a language at school. The second most familiarised programming language is Pascal, and then followed by Java. Other languages, such as PHP, Python, C++, and C# are seldom mentioned by respondents. In total, those languages were only selected by 7% respondents.

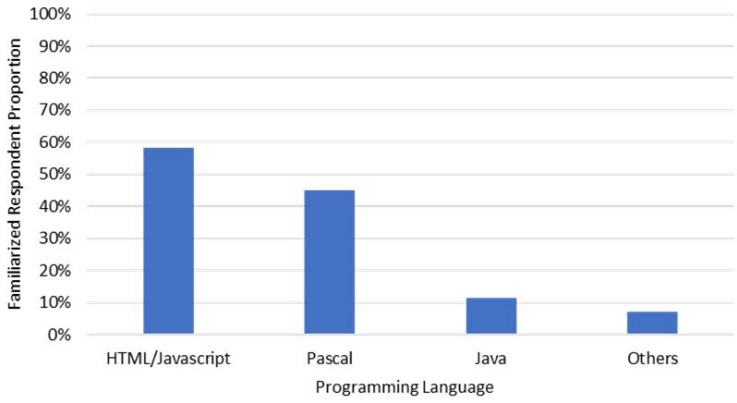


Figure 6: S9 result: familiarised programming languages.

## CONCLUSIONS AND FUTURE WORK

In this article, ICT awareness of high school students in Indonesia is observed. Three significant findings can be derived from the results. First, most students are aware of the existence of ICT. Second, the interaction between the students and ICT devices or services is frequent. Third, most students are familiar with at least one ICT application or skill. In short, it can be concluded that high school students have a considerable amount of ICT awareness. They can learn digital competence easily without utilising advanced teaching methods.

It is important to note that the findings are also beneficial to university stakeholders. In the marketing domain, they could put more advertisements on ICT services (such as social media) since most high school students are aware and familiar with ICT. From the academic perspective, they can put more ICT-based learning in their curricula since most prospective students should be adaptive to it.

For future work, it is planned to observe ICT awareness at the primary and secondary education level. Further, it is also planned to evaluate whether such awareness affects academic performance.

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