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Understandability and usefulness of news articles in explaining electricity generation from biomass: A comparative study on exact and non-exact science university students

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Abstract. Public understanding on biomass energy has been considered as an important factor in the implementation of biomass energy technology. However, there have been a few literatures that have demonstrated public understandability and reaction toward information on the utilization of biomass waste into energy especially for electricity generation. This paper shows understandability of 195 university students toward information on electricity generation from biomass retrieved from newspapers and their perception on whether or not the information is useful in explaining the technology. University students are considered as key actor in technology implementation since they have potential in both technology improvement and implementation into society, such as involvement in R&D activities as their bachelor project or thesis and in-community service program by technology engagement. This paper also highlights how students whose non-exact science background may differ in understandability and usefulness from that of science exact backgrounds. Although students with exact science background have more potential in technology improvement of biomass energy in the future, those with non-exact science background also have more potential in supporting the implementation by public education and campaigns.

1. Introduction

Information on renewable energy plays an important role in the implementation of renewable energy technology into society. Although benefits and importance of renewable energy for environment including biomass energy are well-known, its implementation still encounters some challenges. In addition to technical obstacles, renewable energy also confronts with some non-technical barriers, such as public opinion and perception toward renewable energy. Shaping public opinion and perception is influenced by mass media, because its role is to inform public about all aspects of our live, including developments in science and technology [1].

Newspaper is one of the mass media which has been used in scholarly publication for various purposes. After tsunami in Asia, December 2004, articles from newspapers were used for



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identification of the way by which various actors have used United Kingdom national newspaper coverage on Asian tsunami to promote particular agendas to legitimize policies and actions [2]. In order to address public acceptance issue of photovoltaic (PV) solar energy in Spain, a content analysis on Spanish newspaper articles has been carried out [3]. In order to show reflection of pro-nuclear or anti-nuclear arguments and what issues are more often presented in the arguments, a content media analysis of articles related to nuclear power in Chinese daily has been studied [4]. Study on the shift of public attention toward renewable energy has also been conducted in the wake of Fukushima nuclear accident. The study examined public figures' comments found by using content media analysis of an Indonesian newspaper [5]. Therefore, this study also employed news and articles retrieved from newspapers.

Investigation on students' understanding, attitude, and opinion has been carried out since student is considered as a key potential toward future implementation of policy including technology. Current students would be policy makers in the future. They are also considered as both potential consumers and possible experts in the future. Their early understanding on certain issues may influence their future decision regarding the issues. A study toward university students in Bahrain revealed their knowledge and awareness on global warming leading to some recommendations on university curriculum [6]. Attitudes and knowledge regarding energy, specifically from forest bio-energy among Chinese university students have been investigated based on their opinions [7]. The study indicated that further environmental and energy education in China is urgently needed. For the case of Japan, a study on high school students' attitudes toward nuclear power generation and other science and technology has also been conducted. It also studied relationship between students' interests in science and their attitudes toward nuclear power generation [8]. Therefore, this study also recruited university students as the respondents.

Distinction in exact and non-exact science students' background has appeared on previous study. Warner followed-up comparison study on female students majoring in exact science and non-exact science in terms of academic ability, achievement, vocational interests, and personality traits [9]. Venkatarani studied visualization and interactivity in teaching of chemistry by using molecular modelling to science and non-science students [10]. Mosseri created a theoretical framework for integration of scientific aspects in architectural studies, in addition to artistic aspects which is a non-exact science. Mosseri also offered combination of possible direction which might improve the integration [11].

The questionnaire survey for this study adopts a leading work of Harvey and Fleming in the selection of printed health promotion materials used by Environmental Health Departments in the United Kingdom [12]. Their work examined how effective environmental health promotion brochures in conveying intended message to the target audience. The effectiveness was evaluated by two interlinked stages; a qualitative measure of how easy the written text is read by a standardized readability test and a measurement of reader reaction to the promotion brochure. However, the work presented in this paper used only the second stage of the effectiveness evaluation, which is reader reaction.

The questionnaire explored six parameters of the written information; (1) attitudes toward amount of text, (2) perceived ease to follow the text, (3) attitudes toward difficulty of word and phrases chosen to construct the text, (4) opinions on whether more common words and phrases would make the text easier to understand, (5) opinions on general comprehension of the text others, and (6) perceived use of the text in explaining certain issues [12]. In this current paper, only two of them are presented; perceived ease to follow the text and perceived use of the text in explaining biomass energy technology.

2. Materials and Methods

2.1. News and articles selection

There are 70 (seventy) news or articles on biomass energy from three prominent Indonesian newspapers, *Kompas*, *Jawa Pos* network outlets, and *Koran Tempo*. They are from January 1st, 1991 edition until May 25th, 2015 edition. They were selected due to their availability as computer files either in text format or in portable document format (PDF) so that they were easier to be processed and edited for further readability analysis and questionnaire preparation. Among them, 5 (five) articles from *Kompas* daily explaining electricity generation from biomass were selected as the materials of this study. Each title and edition of the articles is shown in the following Table 1.

Table 1. Title and edition of selected news articles as questionnaire material

No.	Title	English translation	Date
1	<i>Bisnis PLTU biomassa prospektif</i>	Business of biomass power plant is prospective	July 10 th , 2012
2	<i>Biomassa hasilkan listrik 49.000 MW</i>	Biomassa generates 49.000 MW of electricity	July 14 th , 2012
3	<i>Listrik: Gasifikasi biomassa prospektif</i>	Electricity: Biomass gasification is prospective	Oct 16 th , 2012
4	<i>PLT biomassa jagung pertama di Indonesia</i>	First biomass power plant from corn in Indonesia	July 22 nd , 2014
5	<i>Limbah sawit untuk atasi krisis listrik</i>	Empty palm fruit bunch to tackle electricity crisis	Sept 17 th , 2014

Article number 1 reports on 2 x 15 Megawatts (MW) biomass power plant owned by a subsidiary of steel company operating in Northern Sumatera. From total power capacity, 10 MW is going to be used by the steel company itself, while the other 20 MW is going to be sold to the utility company. The plant uses empty palm fruit bunch, risk husk, sawdust, and wood chips from rubber tree as the fuel. Article number 2 highlights on how 10 (ten) cities in Indonesia which started development of biomass power plant whose total electricity capacity of 460 MW. It is also informed that state-owned utilities company of Indonesia (PLN) is obliged to purchase electricity generated by biomass power plant at a certain price. Article number 3 underlines on the prospect of biomass power plant in supplying electricity in small islands. As Indonesia consists of thousands of small islands, this type of power plant is suitable to be implemented. Article number 4 reports the official inauguration of the first biomass power plant in Indonesia fueled by corn. The plant has a capacity rate of 500 kW. Cost of electricity generation by using this corn fuel is IDR 1,058 per kilowatt hour (kWh), which is cheaper than that by fuel oil IDR 2,900 per kWh. Article number 5 highlights how biomass power plant fueled by liquid waste of palm oil production – also known as palm oil mill effluent (POME) – was capable of lighting a thousand of households in an area of Sumatera Island. The plant has a power capacity of 1 MW.

2.2. Survey method

This study recruited 300 (three hundreds) university as the respondents. They were requested to read the materials. Following the reading of each material is the questionnaire which is adopted from the previous work of Harvey and Fleming [13]. From the six parameters Harvey and Fleming have explored, only the results of two of them are presented here; perceived ease to follow the text, called understandability, and perceived use of the text in explaining biomass energy technology [12].

The questionnaire was distributed along with all those seventy text materials to the respondents in the classroom. The respondents read all the materials and replied the questionnaire within a week. For this paper, only the results of five aforementioned news and articles in Table 1 are presented here. In order to comply with proper human research ethics, the respondents had been informed about the nature of the research and the academic purpose of the survey. The respondents were also ensured about their confidentiality of their replies.

Respondents were asked to indicate how easy to follow each of aforementioned materials. Perceived ease to follow the materials was addressed by using four levels of Likert-type scale from very easy to very difficult. Respondents were also asked to indicate whether the materials are useful in

explaining biomass energy technology. Perceived use of the materials was also addressed by using four levels of Likert-type scale from very useful to not-useful.

3. Result and Discussion

This study presents two parameters of the survey, perceive ease to follow (understandability) the news and articles and perceive use of the news and articles in explaining biomass energy technology. From each news and articles, the respondents were asked to indicate whether they are very easy, easy, difficult, or very difficult to understand. Frequency of respondent answering very easy and easy were merged, difficult and very difficult were likewise. Each frequency response is reported in regard of respondent's science background. The survey's result is reported in Table 2.

In addition, they were also asked to indicate whether the news and articles are very useful, useful, okay, or not-useful in explaining biomass energy technology. Frequency of respondent answering very useful and useful were merged, however those answering okay and not-useful were not likewise because okay and not-useful are not similar. Each frequency response is also reported in regard of respondent's science background. The survey's result is reported in Table 3.

This survey has some challenges as suggested by previous study in the adoption of Harvey and Fleming's rapid appraisal method [14]. It will not easy to obtain respondents' willingness to completely fulfill the questionnaire due to long text materials as well as time consuming process. However, this survey has 65% response rate, which means 195 out of 300 respondents returned the questionnaire sheets. From 195 respondents, 101 respondents had exact science background because they were from engineering students, and 94 respondents had non-exact science background because they were from communication studies and English teacher training education.

Table 2. Respondents' perceive ease to follow (understandability) the news and articles

Material no.	Respondents' science background	Perceive ease to follow	
		Easy	Difficult
1	Exact	73 (72.3%)	27 (26.7%)
	Non-exact	73 (77.7%)	21 (22.3%)
2	Exact	74 (73.3%)	27 (26.7%)
	Non-exact	68 (72.3%)	24 (25.5%)
3	Exact	66 (65.4%)	34 (33.7%)
	Non-exact	67 (71.3%)	25 (26.6%)
4	Exact	73 (72.3%)	27 (26.7%)
	Non-exact	78 (83.0%)	15 (16.0%)
5	Exact	83 (82.2%)	17 (16.8%)
	Non-exact	76 (80.9%)	17 (18.1%)

The survey found that most of respondents from both exact and non-exact science background have the similar perception in following the news and articles on electricity generation from biomass. Only in article number 3 and 4, more respondents with exact science background perceived the articles more difficult to follow rather than that with non-exact science background as shown in Table 2. It also means that respondents from exact science background had different perception with that from non-exact science background on the understandability of article number 3 and 4.

Table 3. Respondents' perceive use of the news and articles in explaining biomass energy technology

Material no.	Respondents' science background	Usefulness in explaining biomass energy		
		Useful	Okay	Not-useful
1	Exact	88 (87.1%)	11 (10.9%)	1 (1.0%)
	Non-exact	77 (81.9%)	16 (17.0%)	0 (0.0%)
2	Exact	87 (86.1%)	9 (8.9%)	4 (4.0%)
	Non-exact	80 (85.1%)	12 (12.8%)	2 (2.1%)
3	Exact	88 (87.1%)	11 (10.9%)	1 (1.0%)
	Non-exact	69 (73.4%)	24 (25.5%)	1 (1.1%)
4	Exact	92 (91.1%)	8 (7.9%)	0 (0.0%)
	Non-exact	71 (75.5%)	19 (20.2%)	4 (4.3%)
5	Exact	96 (95.1%)	5 (5.0%)	0 (0.0%)
	Non-exact	78 (83.0%)	12 (12.8%)	3 (3.2%)

For the usefulness of the articles in explaining biomass energy technology, most of the respondent from exact science background had similar perception on usefulness of the articles 1 and 2 with that from non-exact science background. However, toward article 3, 4, and 5, there were more respondents with exact science background who perceived the articles are useful rather than non-exact science respondents. Respondents with different science background had different perception toward usefulness of articles 3, 4, and 5 in explaining biomass energy. In fact, more respondents with non-exact science background perceived the articles 3, 4, and 5 were okay rather than that with exact science background. It implies that some respondents with non-exact background might consider article 3, 4, and 5 as okay rather than useful in explaining biomass energy technology. In comparison to useful and okay perception of respondents from both backgrounds toward the articles, respondents relatively showed agreement that non of all five articles are not useful in explaining biomass energy technology. Only less than 5% of respondents, regardless their science background, perceived some articles are not useful.

4. Conclusion and further research

Exact or non-exact science background of education affects how students perceive ease to follow news and articles in biomass energy technology, especially in electricity generation by biomass energy. In addition, such distinct education background may also affect how students perceive whether news and articles are useful in explaining biomass energy technology. News and articles may be easier to follow (understandable) regardless students' background because they are well written by journalists who are certainly capable of written communication. However, the news and articles are not perceived as always useful in explaining science and technology. It is mainly caused by different information received previously by the respondents especially due to different education background.

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