

Endang Susantini_Artikel12

by Endang Susantini

Submission date: 31-Jan-2019 03:11PM (UTC+0700)

Submission ID: 1070994876

File name: 12_Evendi_2018_J._Phys.___Conf._Ser._1108_012037.pdf (539.56K)

Word count: 3455

Character count: 17992

PAPER • OPEN ACCESS

Improving Students' Scientific Asking Skills through the Implementation of Question Webs Based Learning Model

To cite this article: Evendi *et al* 2018 *J. Phys.: Conf. Ser.* **1108** 012037

View the [article online](#) for updates and enhancements.



IOP | ebooks™

Bringing you innovative digital publishing with leading voices to create your essential collection of books in STEM research.

Start exploring the collection - download the first chapter of every title for free.

Improving Students' Scientific Asking Skills through the Implementation of Question Webs Based Learning Model

Evendi^{1,*}, E Susantini², Wasis³, and B K Prahani⁴

¹Physics Education, University of Syiah Kuala, Jl. T. Hasan Kreung Kalee, Darussalam, Banda Aceh 24415, Indonesia.

²Biology Department, Surabaya State University, Jl. Ketintang, Surabaya 60231, Indonesia.

³Physics Department, Surabaya State University, Jl. Ketintang, Surabaya 60231, Indonesia.

⁴Teacher Education of Madrasah Ibtidaiyah, State Islamic University Sunan Ampel, Jl. A. Yani No. 117, Surabaya 60237, Indonesia.

*Corresponding Author's Email: evendi@unsyiah.ac.id

Abstract. This research aims to improve students' scientific asking skills through the implementation of Question Webs Based Learning (QWBL) model. This research used one group pre-test and post-test design implemented for senior high school students enrolled in 2017/2018 academic period. The Students' scientific asking skills were measured by using Scientific Asking Skills Assessment Sheet (SASAS). The obtained data were analysed using paired t-test and n-gain. Results showed that: (1) The average post-test score was 3.42 (high category), (2) the average score of n-gain students' scientific asking skills was 0.67 (medium category), and (3) the students responded very positively (95%) to the implementation of QWBL Model. Another result found that more than 75% of the students felt courageous to ask scientific questions through writing. This research implies that QWBL Model can be used to improve students' scientific asking skills in various education levels in Indonesia.

1. Introduction

The process of teaching physics is done by the application of scientific method. One of the components students have to master in applying the method is *scientific asking skills*, student's skill in asking scientific questions. Scientific question is a typical question that can be answered through experiment and based on factual reasons or evidence [1-5]. Scientific questions play an important role in the process of education in schools because such questions will have a positive impact on students, such as (1) increasing their active learning participation, (2) developing their thinking processes to help maintain their attention, (3) assessing their learning to arouse curiosity, (4) stimulating interest and making them more confident, (5) and motivating them to seek new information [6-9].

Early research results [9] on scientific questions showed that students' ability to ask scientific questions in oral or in writing in physics learning was still low. The number of students who were able to ask questions verbally were only 20% of the total students and 80% of them all are unable to ask questions verbally. Most students did not want to ask verbally because they (1) did not know what to ask, (2) did not dare to ask, (3) felt fear in conveying wrong question or not in line with the taught concept, (4) felt unsatisfied with the teacher's responses, (5) preferred to hear rather than to ask questions. Similarly, previous research resulted that students' ability in formulating questions based on Blooms' taxonomy showed low levels; it was 86% recall, 7% application, and 7% not yet able to formulate questions [9-10]. The results of this study are in accordance with the opinion initiated by Kaberman & Dori that along with the increasing level of education, the phenomenon of many

students who rarely ask questions and do not even want to ask during the learning process often happens [9,11].

One of the innovative learning models to improve scientific asking skills of senior high school students is Question Webs Based Learning (QWBL) model. The web question is a chart of questions designed to help students inquire about the predictions, theories, and the results of an experiment or concept studied [3]. The model has a syntax that consists of 5 phases, they are: (1) Identifying problems and conveying goals, (2) Delivering information and compiling questionnaires, (3) Discussing scientific questions, (4) Reflecting on scientific questions and (5) Evaluation [9]. Each phase or step in the model is supported by the latest theoretical and empirical foundations. In addition, the model and its instruments have been validated by experts or validators in a Focus Group Discussion (FGD) and stated to be very valid (on content validity and construct validity) and reliable, so that the QWBL model is declared eligible to be applied in school [9].

2. Experimental Method

2.1 General Background of Research

This research belongs to Educational Design Research (EDR) [10]. The purpose of this research was to analyse the improvement of scientific asking skills of senior high school students through the implementation of QWBL model on physics learning. This research used one-group pre-test and post-test design. The improvement of students' scientific asking skills through the implementation of the QWBL model was determined based on: (1) The average post-test scores involving students' scientific skills at least in scientific category, (2) a significant increase (statistically) on the pre-test and post-test scores, (3) average n-gain determined at least on the middle improvement criteria, and (4) the students' response that must be at least positive.

2.2 Sample of Research

The samples of this research were 20 students of senior high school in Aceh, Indonesia at academic year 2017/2018 who took physics course especially in static fluid materials. The samples determination used purposive sampling technique [13].

2.3 Instrument and Procedures

Scientific asking skills of senior high school students were measured using the Scientific Asking Skills Assessment Sheet (SASAS). SASAS was prepared based on the scientific indicators of the measured skills like shown in Table 1. The high school students' responses to the implementation of the QWBL model was measured by using a student response questionnaire [9, 13-14].

This study was classified as a pre-experimental study that used one group pre-test and post-test design, which was O1 X O2 (13, 16-17). The learning started by giving pre-test (O1). Then, the teacher applied QWBL model and physics learning instruments in the experimental class (X) for four meetings. In each meeting, students were given a questionnaire webs sheet to train them ably composing questions in accordance with the taught concept. The teacher gave a fundamental question written on the middle circle of the questionnaire webs sheet. Students were asked to write sub-questions in general based on the given margin of the first page of the questionnaire (Figure 1a) by using the question word "H&5W Questions" (what, why, who, whom, where, which, how). The teacher asked students to write scientific questions on the second page (Figure 1b) based on the sub-questions on the first page by using one of the scientific questions formats: a) is there a relationship between..... With.....? b) What factors are causing.....? c) Is there any influence.....to? d) What is the relationship between to.....? [2,9]. The preparation of questionnaire webs sheets pages was done by students in groups to produce qualified scientific questions. The implementation of the QWBL model on physics learning was ended by post-test (O2) using SASAS. Each senior high school student was required to complete SASAS and filled out a response questionnaire on the post-test.

2.4 Data Analysis

Table 1 and Table 2 show the data analysis of students' scientific asking skills before and after the implementation the QWBL Model based rubric.

Table 1. The rubric to assess indicator of the scientific asking skills.

Indicator	Assessment aspect	Score
1. Using one of the scientific question formats	Formulated by using one of the scientific question formats.	1.00
2. Shows two or more variables.	The scientific question shows the relationship between two or more variables that can be tested.	1.00
3. Contains facts or evidence	The scientific question contains facts or evidence that can be investigated or experimentation.	1.00
4. Not based on values and opinions	The scientific question not based on values and opinions.	1.00
Total		4.00

Table 2. The assessment category of scientific asking skills.

Score	Scientific asking skills category	Notes
$3.20 < x \leq 4.00$	Very scientific	It contains all aspects of the assessment
$2.40 < x \leq 3.20$	Scientific	It contains three aspects of assessment
$1.60 < x \leq 2.40$	Less scientific	It contains two aspects of assessment
$0.80 < x \leq 1.60$	Very less scientific	It contains only one aspect of the assessment
$0.00 < x \leq 0.80$	Not scientific	It does not contain any aspect of the assessment

The degree of increased score of students' scientific asking skills was analysed by using the n-gain equation [9,18]. The n-gain score was determined by the following criteria: High > 0.70 ; medium $0.30 - 0.70$; Low < 0.30 . The pre-test and post-test data of scientific asking skills of high school students were analysed by using inferential statistic with the help of SPSS software.

3. Result and Discussion

Table 3 presents the results of the QWBL model implementation on physics learning. The scientific asking skills of senior high school students at pre-test in 4 students (20%) were in very less scientific category, 11 students (55%) were less scientific and 5 students (25%) were in the scientific category. In general, students' scientific asking skills before the implementation of the QWBL Model were only 2.17 (less scientific category). These findings were supported by the research [9] that the scientific asking skills of high school students are still low because they are not trained by teachers and students are still afraid to ask even if they do not understand the concept of physics that is being described by the teacher.

Conversely, after the implementation of QWBL model, senior high school students' scientific asking skills increased. At post-test, 16 students (80%) were in very scientific category while the other 4 students (20%) were in scientific category. The application of the QWBL model could improve students' scientific asking skills from 75% less scientific and very less scientific to 80% high scientific. The increase of n-gain score was from 0.38 to 0.94 which meant in moderate and high category. This increase in n-gain indicated that the QWBL model was effective to improve scientific asking skills in physics learning especially on static fluid materials

Table 3. The average score of pre-test, post-test and n-gain on scientific asking skills of high school students in physics learning.

Students	Pre-test	Category	Post-test	Category	N-gain	Category
S1	1.60	Very Less Scientific	3.87	Very Scientific	0.94	High
S2	2.20	Less Scientific	3.47	Very Scientific	0.70	Medium
S3	2.80	Scientific	3.33	Very Scientific	0.44	Medium
S4	1.60	Very Less Scientific	3.40	Very Scientific	0.75	High
S5	2.13	Less Scientific	3.60	Very Scientific	0.79	High
S6	1.87	Less Scientific	3.27	Very Scientific	0.66	Medium
S7	3.13	Scientific	3.73	Very Scientific	0.69	Medium
S8	2.40	Scientific	2.93	Scientific	0.33	Medium
S9	2.13	Less Scientific	3.33	Very Scientific	0.64	Medium
S10	2.67	Scientific	3.60	Very Scientific	0.70	Medium
S11	1.87	Less Scientific	3.87	Very Scientific	0.94	High
S12	2.00	Less Scientific	3.53	Very Scientific	0.77	High
S13	3.00	Scientific	3.60	Very Scientific	0.60	Medium
S14	1.60	Very Less Scientific	3.53	Very Scientific	0.81	High
S15	2.20	Less Scientific	3.67	Very Scientific	0.81	High
S16	2.20	Less Scientific	3.33	Very Scientific	0.63	Medium
S17	1.33	Very Less Scientific	2.47	Scientific	0.43	Medium
S18	2.20	Less Scientific	3.20	Scientific	0.56	Medium
S19	2.27	Less Scientific	3.47	Very Scientific	0.69	Medium
S20	2.27	Less Scientific	3.13	Scientific	0.50	Medium
Average	2.17	Less Scientific	3.42	Very Scientific	0.67	Medium

In general, scientific asking skills of high school students during post-test is 3.42 (very scientific category) and n-gain was in moderate categories. The results of this study are supported by the results of previous studies [19-31] that learning, teaching, models, methods, instruments, and media that are eligible, qualified, valid, practical, and effective will enhance and achieve learning objectives. That is, different test of pre-test score and post-test of scientific asking skills on the implementation of QWBL Model used Paired t-test (see Table 4).

Table 4. The results of Paired t-test of students' scientific asking skills.

Paired Samples Test, $\alpha = 5\%$						
	Mean	Std. Deviation	Std. Error Mean	T	df	Sig. (2-tailed)
Pre-test – Post-test	-1.24	0.50	0.11	-11.07	19	0.00

Table 4 shows that the mean score of students' scientific asking skills was -1.24 and had degrees of freedom (df) of 19, t arithmetic of -11.07. This result was significant because $p < 5\%$. The result of the calculation had a negative sign, which meant that the pre-test was different from the post-test (scientific) perceived by the students after using QWBL model in physics learning. The students' positive response to the QWBL model was 95% of students who said that the QWBL Model could motivate students to ask questions. The students' learning outcomes increased as they had a good response to the learning [33]. Increasing student involvement can improve learning outcomes in terms of the effectiveness, measurable learning, high students' achievement, and their learning responses [34]. A teaching is said to be effective when a teacher has the right strategy for conveying his knowledge to students structurally and can integrate theory and practice into the learning process [35]. The active participation of students in learning by using the QWBL Model can be seen from the work of the student groups in preparing the question webs sheet as in Figure 1.

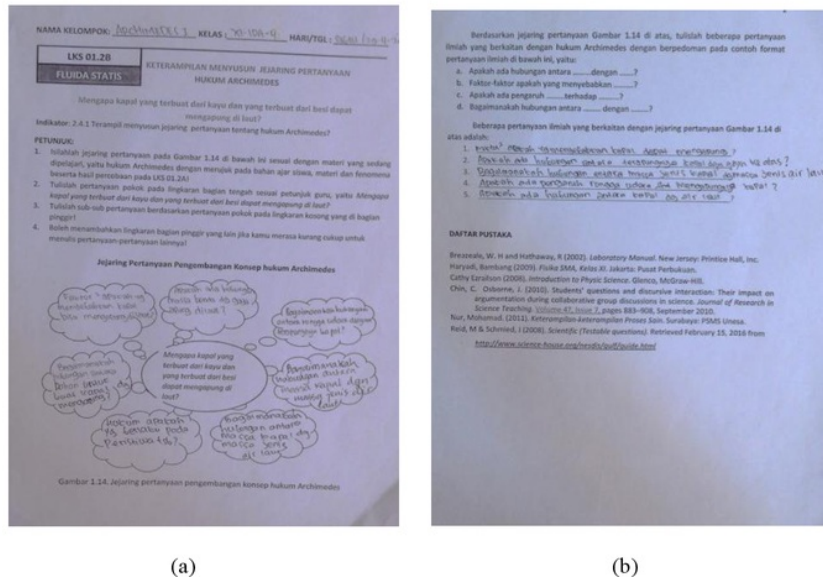


Figure 1. Question webs sheet.

The question webs sheet were arranged in groups to produce qualified questions, although there were some general questions that had not led to scientific questions on the first sheet such as "What is the relationship between floating materials for ships?" and "on the event?" but based on the agreement in the students group discussion, the general questions on the first page were rearranged into several scientific questions on the second page such as "Is there a relationship between the density of the ship and the sea water mass?". These scientific questions were used by students to conduct class discussions. If students did not dare to ask questions verbally or were afraid making wrong questions, then students could ask questions in writing by reading the questions on the questionnaire.

Principle finding based on interview questions with several students was that more than 75% of students at first were not courageous to ask question because they were afraid the questions were wrong and fear of being laughed at by friends. However, after being taught by implementation of the QWBL Model, the students feel more courageous in scientific writing and can ask scientific questions through writing and oral with the question is very scientific. The results of this study proves that the implementation of the QWBL Model in physics learning proved to be effective in improving the scientific asking skills of senior high school students.

4. Conclusion

Question webs Based Learning (QWBL) model is specifically designed to improve students' scientific asking skills. The results of the research prove that: (1) The average post-test score was 3.42 (high scientific category); (2) Average n-gain score of students' scientific asking skills was 0.67 (medium category); and (3) Students responded very positively (95%) to the implementation of QWBL model. Principle finding based on interview results was that students feel more courageous in scientific writing and can ask scientific questions through writing and oral. Therefore, the QWBL Model has proven to be effective for improving the scientific asking skills of high school students. The implication of this research is that QWBL Model is expected to be implemented to improve students' scientific inquiring skills in various education levels in Indonesia. Further research is expected to be done at different levels of education and country.

5. References

- [1] Research Council 2000 *Inquiry and the National Science Education Standards: A guide for Teaching and learning* (Washington D.C: National Academy Press)
- [2] Nur M 2011 *Modul Keterampilan Proses Sains* (Surabaya: Universitas Negeri Surabaya)
- [3] Chin C and Osborne J 2010 *J. Res. Sci. Teach.* **47** 883
- [4] Nussbaum E and Edwards O V 2011 *J. Learn. Sci.* **20** 443
- [5] Chiron G and Sandra R 2012 *J. College Sci. Teach.* **14** 46
- [6] Wragg E and Brown G 2001 *Questioning in the Secondary School* (London: Routledge Falmer)
- [7] Eggen Kauchak 2012 *Strategy and Model for Teacher: Teaching Content and Thinking Skills* (Boston: Pearson Education Inc)
- [8] Harrold P 2013 *Any Questions? Designing An Observation Instrument To Record Teacher Questioning* (Japan: Kanda University of International Studies)
- [9] Evendi 2018 *Makalah Seminar Hasil* (Surabaya: Pascasarjana Unesa)
- [10] Nieveen N 2010 *Formative Evaluation in Educational Design Research* Enschede (the Netherlands: SLO)
- [11] Liliasari 2003 *J. Pendidik. Matematika dan Sains* **3** 174
- [12] Kaberman Z and Dori Y J 2009 *J. Sci. Math. Educ.* **7** 597
- [13] Fraenkel J R, Wallen N E, and Hyun H H 2012 *How to Design and Evaluate Research in Education* (New York: McGraw-Hill)
- [14] Erika F, Prahani B K, Supardi Z A I and Tukiran 2018 *WTE & TE* **17** 1
- [15] Lan Y F and Lin P C 2011 *Australasian J. Educ. Tech.* **27** 581
- [16] Prahani B K, Winata S W and Yuanita L 2015 *J. Penelit. Pendidik. Sains* **4** 503
- [17] Prahani B K, Limatahu I, Nur M and Yuanita L 2016 *Int. J. Educ. Res.* **4** 231
- [18] Hake R R 1998 *Am. J. Phys.* **66** 64
- [19] Hadi S A, Susantini E and Agustini R 2018 *J. Phys: Conf. Ser.* **947** 012063
- [20] Jatmiko B, Prahani B K, Munasir, Supardi Z A I, Wicaksono I, Erlina N, Pandiangan P, Althaf R and Zainuddin 2018 *J. Baltic Sci. Educ.* **17** 1
- [21] Limatahu I, Suyatno S, Wasis and Prahani B K *J. Phys.: Conf. Ser.* **997** 0120022
- [22] Madeali H and Prahani B K 2018 *J. Phys: Conf. Ser.* **997** 0120029
- [23] Prahani B K, Suprpto N, Suliyanah, Lestari N A, Jauharyyah M N R, Admoko S and Wahyuni S 2018 *J. Phys.: Conf. Ser.* **997** 0120008
- [24] Purwaningsih E, Suyatno S, Wasis and Prahani B K 2018 *J. Phys: Conf. Ser.* **997** 0120032
- [25] Sudiarman W, Soegimin W and Susantini E 2015 *J. Penelit. Pendidik. Sains* **4** 636
- [26] Sunarti T, Wasis, Madlazim, Suyidno and Prahani B K 2018 *J. Phys: Conf. Ser.* **997** 0120013
- [27] Susantini E, Isnawati and Lisdiana L 2016 *J. Sci. Educ.* **2** 74
- [28] Susantini E, Lisdiana L, Isnawati, Al Haq A T and Trimulyono G 2017 *Biochemistry and Molecular Bio. Educ.* **45** 216
- [29] Susantini E and Qomariyah N 2013 *J. Pendidik. IPA Indonesia* **2** 142
- [30] Susantini E, Thamrin M, Isnawati H and Lisdiana L 2012 *J. Pendidik. IPA Indonesia* **1** 102
- [31] Suyidno, Nur M, Yuanita L, Prahani B K and Jatmiko B 2018 *J. Baltic Sci. Educ.* **17** 136
- [32] Wicaksono I, Wasis and Madlazim 2017 *J. Baltic Sci. Educ.* **16** 54
- [33] Zimmerman B J and Schunk D H 2012 *Self-Regulated Learning and Academic Achievement: Theory, Research, and Practice* (New York: Springer Science & Business Media)
- [34] Jatmiko B, Widodo W, Budiyo M, and Wicaksono I, 2016 *J. Baltic Sci. Educ.* **15** 441
- [35] Hughes J 2005 *J. Tech. Teach. Educ.* **13** 277

Acknowledgment

The author's gratitude goes to the Ministry of Research, Technology and Higher Education for funding the Research (SK Number: 15/UN11.2/PP/SP3/2018). Likewise, the author's gratitude goes to the University of Syiah Kuala, Surabaya State University, State Islamic University of Sunan Ampel Surabaya and Senior High School Students (Aceh, Indonesia) that have provided research opportunities.

Endang Susantini_Artikel12

ORIGINALITY REPORT

17%

SIMILARITY INDEX

16%

INTERNET SOURCES

9%

PUBLICATIONS

0%

STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

6%

★ oaji.net

Internet Source

Exclude quotes Off

Exclude bibliography On

Exclude matches Off