

DAFTAR ISI

Journal of Turkish Science Education (TUSED):

1. Screen capture TUSED di Source Scopus.com
2. Screen capture TUSED di scimagojr.com
3. Sampul TUSED
4. Editorial Board TUSED
5. Daftar Isi TUSED Vol 6 No. 2 tahun 2019
6. Copy Artikel



Scopus Preview

[Author search](#) [Sources](#)[Create account](#)

Source details

Journal of Turkish Science Education

Open Access

Scopus coverage years: from 2009 to 2019

Publisher: Ekip Limited

ISSN: 1304-6020

Subject area: [Social Sciences: Education](#) [Psychology: Applied Psychology](#)[View all documents >](#)[Set document alert](#)[Save to source list](#) [Journal Homepage](#)

CiteScore 2018

1.19[Add CiteScore to your site](#)

SJR 2018

0.314

SNIP 2018

1.384[CiteScore](#) [CiteScore rank & trend](#) [CiteScore presets](#) [Scopus content coverage](#)

CiteScore 2018

Calculated using data from 30 April, 2019

CiteScore rank

$$1.19 = \frac{\text{Citation Count 2018}}{\text{Documents 2015 - 2017}^*} = \frac{100 \text{ Citations } >}{84 \text{ Documents } >}$$

*CiteScore includes all available document types

[View CiteScore methodology >](#) [CiteScore FAQ >](#)

Category	Rank	Percentile
Social Sciences Education	#395/1038	
Psychology Applied Psychology	#127/216	

CiteScoreTracker 2019




Last updated on 08 January, 2020
Updated monthly

$$1.38 = \frac{\text{Citation Count 2019}}{\text{Documents 2016 - 2018}} = \frac{127 \text{ Citations to date } >}{92 \text{ Documents to date } >}$$

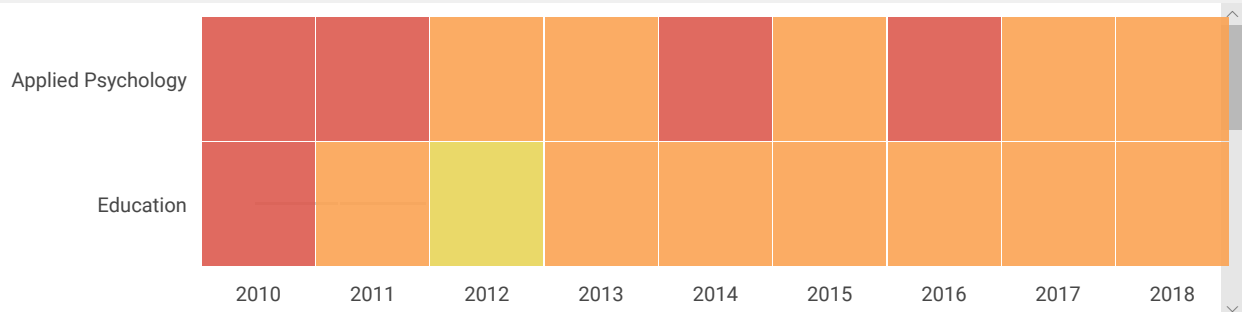
[View CiteScore trends >](#)

Metrics displaying this icon are compiled according to Snowball Metrics , a collaboration between industry and academia.

Journal of Turkish Science Education

Country	Turkey -  SJR Ranking of Turkey	<h1>11</h1> <hr/> H Index
Subject Area and Category	Psychology Applied Psychology Social Sciences Education	
Publisher	Ekip Limited	
Publication type	Journals	
ISSN	13046020	
Coverage	2009-ongoing	
Scope	<p>Journal of Turkish Science Education (TUSED) is an international on-line, refereed science education journal that is published four issues in a year. Its target populations are science educators, science education students, teachers, and people and institutions who produce products and provide services for educational communities. Original scientific studies are published in the TUSED for the target population. TUSED is published both in Turkish and English between the years 2004-2016. But with the 2016 TUSED is only accept articles written in English. The scope of TUSED is basically science (physics, chemistry, biology) education - including pre-service and in-service science teacher education, development and implementation of science curriculum, learning and teaching strategies in science education, measurement and assessment in science education and the use of Information and Communications Technologies in science education. Manuscripts covering theoretical narratives about science education and methodological discussions on research in science education are also taken into consideration to be published in TUSED.</p>	
	<p> Homepage</p> <p>How to publish in this journal</p> <p>Contact</p> <p> Join the conversation about this journal</p>	

Quartiles



Journal of Turkish Science Education

[Home](#) [About](#) [For Authors](#) [Browse](#) [Announcements](#)[Search](#)

Aim and Scope

Journal of Turkish Science Education (TUSED) publishes scholarly papers that concentrate on science teaching and learning in school settings ranging from early childhood to higher education as well as workplace and informal learning, which are related to science education. Hence, its purpose is to link research with practice by providing information, ideas, opinions and insights. As an international journal, the TUSED welcomes contributions from all over the world.

In looking for research to publish, the TUSED seeks manuscripts that will make contributions to and advance our knowledge in science education research rather than duplicating what has already been done and known. Thus, the TUSED is also interested in publishing valid and original research that address new capabilities of science learning/teaching and innovative practices in science learning/teaching. The TUSED especially emphasizes research in educational practice and scholastic realities in schools and universities. The TUSED may directly be concerned with science education, but it also welcomes manuscripts on interdisciplinary research areas, e.g., Science, Technology, Engineering, and Mathematics (STEM).

The TUSED is the journal associated with the Organization, Education and Consultancy Company (www.oregda.com) and the Ekip Limited Company which provide educational services to public institutions and private companies. Also TUSED is supported by the Faculty of Education of Uludag University (<http://uludag.edu.tr/egitim/default/konu/5775>). So, the TUSED will continue to review articles, editorials, book reviews, and other teaching/measurement materials in science education and related science disciplines.

Information

[For Readers](#)[For Authors](#)[For Librarians](#)[Make a Submission](#)

Journal of Turkish Science Education

Platform &
workflow by
OJS / PKP

Journal of Turkish Science Education

[Home](#) [About](#) [For Authors](#) [Browse](#) [Announcements](#)[Search](#)[Home](#) / [Editorial Team](#)

Editor-In-Chief

Prof. Dr. Salih Çepni

Professor, Science Education, Bursa Uludag University, Turkey

Associate Editors

Richard Coll, University of the South Pacific, Fiji

Keith Taber, University of Cambridge, England

Dana Zeidler, University of South Florida, USA

Neil Taylor, University of New England, Australia

Georgias Tsaparlis, University of Ioannina, Greece

William Cobern, Western Michigan University, USA

Yang-Hsueh Chen, National University of Tainan, Taiwan

Sibel Erduran, University of Oxford, England

Mansoor Niaz, Universidad de Oriente, Venezuela

Mehmet Aydeniz, The University of Tennessee, USA

Mustafa Sözbilir, Ataturk University, Turkey

Muammer Calik, Karadeniz Technical University, Turkey

Alipasa Ayas, Bilkent University, Turkey

Lilia Halim, The National University of Malaysia, Malaysia

Ali Sharaf Al Musawi, Sultan Qboos University, Oman

Journal of Turkish Science Education

Information

[For Readers](#)[For Authors](#)[For Librarians](#)[Make a Submission](#)

Platform &
workflow by
OJS / PKP

[Home](#) / [Archives](#) / Vol 16 No 2 (2019)

Published: 2019-11-07

Articles

Effectiveness of Authentic Assessment: Performances, Attitudes, and Prohibitive Factors

Wahyu Budi SABIYAWAN, Leny YUANITA, Yuni Sri RAHAYU

156-175

**Enhanced Learning through Analogy in the Teaching of Cardiovascular System**

Ankhi PAUL, Andery LIM, Sallimah M. SALLEH, Masitah SHAHRILL

176-186

**Improving Basic Science Process Skills Through Inquiry-Based Approach in Learning Science for Early Elementary Students**

Trisna MULYENI, Martini JAMARIS, Yetti SUPRIYATI

187-201

**Moroccan University Students' Conceptions of Neurotransmission**

Ihsane KOUCHOU, Fatima KADDARI

202-215

**The Effect of Integration of STEM Disciplines into Toulmin's Argumentation Model on Students' Academic Achievement, Reflective Thinking, and Psychomotor Skills**

Salih GÜLEN, Süleyman YAMAN

216-230

**The Effects of Science-On-Web Learning Media on Junior High School Students' Learning Independency Levels and Learning Outcomes**

Jaslin IKHSAN, Muhammad AKHYAR, Miarti Khikmatun NAIS

231-239

**The Development of a Resource Guide in Assessing Students' Science Manipulative Skills at Secondary Schools**

Hidayah Mohd FADZIL, Rohaida Mohd SAAT

240-252

**The Effect of Chemo-Entrepreneurship Oriented Inquiry Module on Improving Students' Creative Thinking Ability**

Citra Ayu DEWI, Ratna Azizah MASHAMI

253-263

**The Importance of the Concept of Water in Biology Education**

Lütfiye ÖZALEMDAR

264-277

**The Application of STEM Education in Science Learning at Schools in Industrial Areas**

PARMIN, SAJIDAN

278-289



Journal of Turkish Science Education

Information

[For Readers](#)[For Authors](#)[For Librarians](#)[Make a Submission](#)

The Effects of *Science-On-Web* Learning Media on Junior High School Students' Learning Independency Levels and Learning Outcomes

Jaslin IKHSAN¹ , Muhammad AKHYAR², Miarti Khikmatun NAIS³

¹ Ph.D., Department of Chemistry Education, Faculty of Mathematics and Sciences, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Yogyakarta 55281, INDONESIA

² M.Pd., SMP Negeri 16 Tanjungpinang, Kota Tanjung Pinang, Kepulauan Riau 29125, INDONESIA

³ M.Pd., Department of Chemistry Education, Universitas Negeri Yogyakarta, Colombo Street No.1, Karangmalang, Yogyakarta 55281, INDONESIA

Received: 21.08.2017

Revised: 20.06.2018

Accepted: 25.11.2018

The original language of article is English (v.16, n.2, June 2019, pp. 231-239, doi: 10.12973/tused.10277a)

Reference: Ikhsan, J., Akhyar, M. & Nais, M.K. (2019). The Effects of Science-On-Web Learning Media on Junior High School Students' Learning Independency Levels and Learning Outcomes. *Journal of Turkish Science Education*, 16(2), 231-239.

ABSTRACT

This research aimed to examine the effects of science-on-web learning media on grade 8 students' learning independency levels and learning outcomes of 'excretion system' topic. Through a quasi-experimental research method within non-equivalent control group design, 70 grade 8 students drawn from Tanjungpinang, Indonesia participated in the study. Pretest and posttest were carried out before and after the teaching intervention. Two intact groups were assigned as the experimental and control classes (35 by 35). The experimental class was exposed to the science-on-web learning media, while the control one was instructed through the electronic module. Data were collected through a learning independency observation sheet and a learning outcomes test. This research showed that the experimental class significantly performed better at learning independency levels and learning outcomes than the control one.

Keywords: Learning independency, learning media, learning outcomes, science-on-web.

INTRODUCTION

Information and communication technology (ICT) has dramatically been improving in this globalized era. ICT aspects include such digital media tools as computer, laptop, internet and smartphone. Computer and internet contribute a great educational advantage to learning. Thus, teacher should encourage students to utilize computer and internet as important tools to support education, improve knowledge, broaden the opportunities and empower a better qualified life.



Schools, as social institutions, play an important role in changing people's lives. Hence, schools purpose to equip students with challenging any rapid change. That is, ICT facilities in schools enable students to actively and independently achieve learning. Further, teachers need to have these skills to improve and use learning media. Arsyad (2014) and Sadiman et al. (2017) state that media, which acts as a tool to deliver learning messages from sender to receiver, stimulates student's mind, emotion, attention and passion to the learning process. These experts' arguments imply that using the appropriate learning media affords students to build a better understanding of science and triggers their learning motivation to achieve learning goals.

One of the learning media is computer-based-multimedia that Indonesian in junior high school students are familiar with. While choosing appropriate learning media, students' characteristics, learning trends and challenges should be taken into consideration. For example; an audio visual media on website, which is accessible at any time by using computer, laptop, notebook or smartphone, meets their characteristics. In view of Rusman (2013), the object and interactive-computer-based media are the best resources for communication purposes/needs. These types of learning not only focus on media or objects, but also encourage students to actively interact with the media or peers.

Yen, Tuan, & Liao (2011), who conducted a web-based research, found that web-based learning made a significantly higher contribution to learning outcomes and assisted students in accomplishing a better understanding of the topic. Similarly, Shih et al. (2010) depicted that web-based learning media gave an opportunity for students to improve student's knowledge and self-regulated learning. Therefore, it is believed that the use of *science-on-web* learning media in form of HTML may create a funny and interesting learning environment for classical or individual (independent) learning.

The 'Excretion System' topic has its own characteristics in that it links structural, functional, procedural features of daily live to health of kidney, liver, lung and skin. The excretion system is an intangible topic to help students visualize and understand it via an interesting learning media. Web-based science learning media (*science-on-web*) has a potential to enable them to visualize the excretion concept.

As a new learning environment, web users can design and use web pages to get any help and information on the Internet. For instance; some students use websites to visualize any phenomenon or example (Donovan & Nakhleh, 2001). Therefore, web pages can be used to attain learning processes.

HTML (Hyper Text Markup Language), which is a programming language to create web pages, contains easy accessible information for people (Curran Bond, & Fisher, 2012). The newest HTML version is HTML5 that many browsers in computer and mobile devices have supported (Baker, 2014; Chen et al., 2013). HTML5 contains texts, static graphics and dynamic graphics (e.g., animation), hyper textual and graphical links. HTML5 can also be inserted within other programming languages (e.g., Java script, Java and CSS3) to design more interactive web pages (Garaizar, Vadillo & López-De-Ipiña. 2014; Sikos, 2011).

HTML5, which has an advantage not to need a special compiler, such as Fortran and Delphi, simply calls such browsers as Google Chrome, Mozilla Firefox and Microsoft Internet Explorer. Also, HTML5 particularly does not need an external plug-in program (i.e., Adobe Flash) to display audio and video contents (Curran et al. 2012; Lubbers et al., 2011). In other word, HTML5 has been designed as an independent device.

Shih et al. (2010) describe self-regulated learning as a four-attribute learning process:

- (1) *Intrinsically or self-motivated: Self-regulated learners tend to maintain learning behavior with a very strong motivation. Learners can raise this motivation through some practices, such as setting learning goals.*

- (2) *Planned or automatized: Self-regulated learners are apt to use some strategies along with their learning processes, including both cognitive and self-regulated strategies. Generally, learners improve their learning performance when using self-regulated strategies rather than cognitive strategies. Self-regulated strategies contain goal-setting, goal-planning, organization, transition, exercise, and so on. A self-regulated learner needs to effectively use self-regulated strategies for his/her learning.*
- (3) *Self-aware of performance outcomes: Throughout the learning process, self-regulated learners sharpen their self-awareness of learning behaviors. To approach an ideal outcome, self-regulated learners should be aware of their own learning qualities, and change their behaviors or strategies correspondingly.*
- (4) *Environmentally/socially sensitive and resourceful: The learning environment(s) and resources affect one's learning pattern. Self-regulated learners have better skills in seeking learning resources or support. With such ability, they should arrange the environmental conditions and search for other resources effectively (p. 87).*

Benson & Voller (1997) state that self-regulated learning fully depends on student's own performances (e.g., learning and applying skills; practicing individual responsibility as an outcome of self-regulated learning; and determining their own learning paths).

Learning independence, as a learning process, affords students to plan, monitor and manage their own learning (Marini & Boruchovitch, 2014). Tsai, Hsu, & Tseng (2013) state that self-regulated learning, which refers to metacognitive, motivation and behavior processes, enables students to focus on and control their own learning. Metacognitive process includes managing and designing learning, while motivation process incorporates self-evaluation. Further, behavior process contains to choose, set up and create the best learning environment (Wan, Compeau, & Haggerty, 2012). Moreover, a self-regulated learning activity connects learning environment to learning outcomes (Pintrich & Zusho, 2002; Schunk, 2005). Motivation, as an important aspect of self-regulated learning, will trigger student's learning enthusiasm (Bharathi, 2014; Marini & Boruchovitch, 2014; Zimmerman, 2008). Overall, learning independence, as a self-regulated learning activity, not only makes students responsible for their learning processes but also possesses their own study initiatives, self-confidence and a high learning motivation.

The European Union (EU) (2015) implies that learning outcomes mean student's competency/achievement level via measurement and assessment. Learning outcomes includes such statements as what a learner knows, understands and does during a learning process. Kennedy, Hyland, & Ryan (2006) describe learning outcomes as a student's mastery level at learning process.

UNESCO (2015) sees learning outcomes as students' educational knowledge, attitudes, values, and skills. This means that learning includes three main learning domains (i.e., cognitive, affective, and behavior) (Grabau & Ma, 2017; Økland, 2012).

A learning outcome consists of students' learning efforts/performances (i.e., doing, knowing and understanding the targeted issues) in the end of learning period (Brooks et al., 2014). In a similar vein, Adam and Expert (2008) claim that students will gain some knowledge after their involvement with learning process. Hamalik (2011) considers a learning outcome as a learning achievement indicating student's behavioral change. This research aimed to examine the effects of science-on-web learning media on grade 8 students' learning independency levels and learning outcomes of in the 'excretion system' topic. Because science on-web learning media visualizes the concept of excretion, it supports student learning independency. Students can use science-on-web learning media via the guide instructions existing on the media independently. In brief, this study hypothesized that

science-on-web learning media would increase grade 8 students' learning independency levels and learning outcomes.

METHODS

Through a quasi-experimental method within nonequivalent control-group design, pre-test and post-test were carried out before and after the teaching intervention (see Table 1).

Table 1. An outline of the quasi experimental research design

Group	Pretest	Treatment	Posttest
Experimental	T1	X1	T2
Control	T1	X2	T2

T1: Pre-test, T2: Post-test, X1: Science-on-web learning media, X2: Electronic module learning media

The use of science-on-web, which was offline, and CD format for enriched materials, enabled students to independently play at anytime and anywhere. The science-on-web, which was developed via HTML5, included animations and other visualization objects for the 'excretion system' topic. The electronic module learning media involved power points, videos and multimedia.

The sample of the research comprised of 70 grade 8 students drawn from a Junior High School 5 in the state of Tanjungpinang, Indonesia. Two intact groups were assigned as the experimental (17 boys and 18 girls in class VIII E) and control (15 boys and 20 girls in class VIII D).

a) Data Collection Instruments

To collect data, a learning independence observation sheet and a multiple-choice test were exploited. The learning independence observation sheet was used to measure students' learning independence levels, while the objective test was employed to measure their learning outcomes.

b) Learning Independence Observation Sheet

Content and construct validity of a 4-point learning independence observation sheet was ensured by an expert. There were five observed aspects, i.e., responsibility, learning initiative, dependence on other people, self-confidence and learning motivation. These aspects reflecting learning independence were converted into 11 indicators.

c) Multiple-Choice Test

A 30-item multiple choice test was administered as a pre-test and post-test. An expert, whose research interests covered excretion system topic, construction, language and culture, validated the test. The test was pilot-tested with 35 junior high school students, who had already learnt about the topic under investigation. The results of Pearson Product Moment Correlation (r_{xy}) were compared with r product moment (r_{tab}) value. If r_{xy} is larger than r_{tab} , a significant correlation emerges and makes the item valid. That is, 22 out of 30 items were valid since r_{xy} value was larger than r_{tab} , i.e. $r_{xy} > 0.339$. The reliability of learning outcome items was measured using Kuder-Richardson's formulae, named α -20's coefficient (Mardapi, 2008). Reliability value was found to be 0.788 meaning a high reliability.

d) Data Analysis

The students' learning outcome scores to pre-test and post-test were analyzed through gain standard. Meanwhile, their learning independence scores to every observation sheet were also analyzed by using gain standard. Improvement criteria of normalized gain scores are summarized in Table 2 (Hake, 1998).

Table 2. *Improvement criteria of normalized gain score*

No	Normalized Gain Score	Criteria
1	$g \geq 0.70$	High
2	$0.70 > g \geq 0.30$	Intermediate
3	$g < 0.30$	Low

After meeting prerequisite tests, i.e. normality test and similarity of variant covariant matrices test, effectiveness of science-on-web learning media was tested through *One-way* Manova Hotelling's T^2 . Hypothesis of the current study were as follows:

- H_0 : There is no statistically significant difference between mean scores of the experimental (science-on-web learning media) and control (electronic module media) groups' learning independency levels and learning outcomes.
- H_a : There is a statistically significant difference between mean scores of the experimental (science-on-web learning media) and control (electronic module media) groups' learning independency levels and learning outcomes.

FINDINGS

Multivariate normality test indicated a statistically significant value between the experiment and the control class ($p < 0.05$). This means that the data were distributed multivariate normally. The variant covariant matrices similarity test showed a statistically significant value of 0.193, which was higher than 0.05. This depicts that the experimental and control groups' variant covariant matrices were the same.

After fulfilling the prerequisite tests, i.e., multivariate normality test and homogeneity test, Manova test were performed by using SPSS 23TM. The results of hypothetical Manova test are outlined in Table 3.

Table 3. *The results of hypothetical Manova test*

Effect	Value	Sig.	Conclusion
Hotelling's Trace	0.119	0.023	H_0 rejected

a) An Improvement in Student's Learning Independency

Two observers observed every lesson by help of the learning independency observation sheet. Any improvement in student's learning independency level was determined their scores to three lessons. Hence, their gain values were calculated to make a comparison. The results of learning independency levels are presented in Table 4.

Table 4. Mean scores of student's learning independency levels

Class	Average Value			Gain
	Lesson 1	2	3	
Experimental	67.50	75.49	79.94	0,37
Control	62.56	69.71	73.54	0,29

b) An Improvement in Student's Learning Outcomes

The students' learning outcome scores to pre-test and post-test are displayed in Table 5.

Table 5. Mean scores of the experimental and control groups' learning outcome scores to pretest and posttest

Class	Average Value		<g>
	Pretest	Posttest	
Experimental	42.8	80.5	0.66
Control	41.5	76.4	0.59

DISCUSSION and CONCLUSION

As seen from Table 3, because the significance value was less than 0.05, i.e., 0.023, H_0 was rejected, indicating significant difference of learning independency levels and learning outcomes between the experimental and control groups. This means that science-on-web learning media effectively improved the students' learning independency levels and learning outcomes. This result is in a harmony with previous studies indicating that web-based learning improves learning independence (Shih et al., 2010) and learning outcomes (Yen et al 2010). Similarly, Chang (2005), who implemented web-based learning, found that the web-based learning developed the students' learning independence in terms of responsibility and confidence. Chang (2005) also addressed that web-based learning helped them understand the learning material. Robin Kay (2014) also elicited that the students' learning outcomes of natural science lessons significantly increased with web-based learning. This shows that media-assisted learning activities provided opportunities for students to develop knowledge and independent learning. It showed that the students with web-based learning performed better at understanding the related concept than those with direct learning.

As can be seen from Table 4, the experiment group's average values ranged from 67.50 (first lesson) to 79.94 (third lesson). The gain value (0.37) of the experimental group showed an intermediate category. The control group's average values were between 62.56 (first lesson) and 73.54 (third lesson). The gain value (0.29) of the control group revealed a low category. These values showed that the experimental group (science-on-web learning media) had a higher learning independency than that of the control one.

A significant improvement in the experimental group's learning independency may result from features of science-on-web media (e.g., interesting learning media and new technology). That is, these features may have enhanced their learning interest and motivation. This is in a parallel with the result of Nafidi et al. (2017), who drew out a strong learning motivation as an output of the use of computer simulation. This also means that an advanced technology (i.e., science-on-web learning media) empowers student's self-regulated learning (Winters, Greene, & Costich, 2008) and enables students to have a higher independency level (Wang & Wu, 2008). These findings are also in line with those of Chen (2009), Shih et al. (2010) and Lee & Tsai (2011) reporting that web-based self-regulated learning significantly improved student's self-study capability.

As observed in Table 5, mean scores of the experimental group's learning outcomes were 42.8 in pre-test and 80.5 in post-test. Gain value (0.66) of the experimental group

indicated an intermediate category. Meanwhile, mean scores of the control group were 41.5 in pre-test and 76.4 in post-test. Gain value (0.59) revealed an intermediate category. These results showed that the experimental group's (science-on-web learning media) learning outcomes possessed a better improvement than did the control one.

A better improvement in the experimental group's learning outcomes of the 'excretion system' topic may stem from features of science-on-web learning media (e.g., a clearly interesting visualization of the topic). This is in line with the results of Frailich, Kesner & Hofstein (2007), who found that students with web-based chemistry animation and visualization had a better conceptual understanding than those with regular intervention. Similarly, Kusairi, Alfad & Zulaikah (2016) found that web-based learning media was effective in improving students' conceptual understanding. In addition, an improvement in students' learning outcomes is consistent with the results of Kay (2014) reporting that web-based- science learning significantly improved students' learning outcomes.

The use of technology in class, such as web-based-learning media, provides a proper learning process for students and positively affects their learning outcomes (Zimmerman & Tsikalas, 2005). As a matter of fact, Yektyastuti and Ikhsan (2016) found that using android software media improved students' cognitive learning outcomes.

The results of the study showed that the value of learning independence had a correlation with learning outcomes. That is, an increase in student learning independence also improved learning outcomes (Zheng, Li, & Chen, 2016). The relationship between learning independency level and learning outcomes supports the results of Uçar and Sungur (2017) addressing that students with a high independency level had good learning outcomes. The results of the current study indicated that science-on-web learning media of the 'Excretion System' topic might be used as an alternative approach to improve junior high school students' independency levels and learning outcomes.

It can be concluded that science-on-web learning media has a potential to improve junior high school students' learning independency levels and learning outcomes. Thus, the current study recommends that science-on-web learning media be implemented in schools to support their science learning independency and science learning outcomes.

Suggestions

The availability of wide coverage of internet connection in schools and supporting infrastructures for online learning in Indonesia can assist students to improve their learning independency levels. This fact may contribute to success of education program in 4.0 industrial revolution era in Indonesia. Given the results of the current study, it suggests that science teachers and students should use science-on-web learning media as a medium to accomplish natural science learning. Future studies ought to develop similar science learning media/materials, and integrated into various learning strategies for better learning outcomes.

ACKNOWLEDGMENTS

Authors would like to thank to the Ministry of Research, Technology, and Higher Education of the Republic of Indonesia for financial support of the research, with the contract No. 07/Penel./Tim Pasca Sarjana/UN34.21/2017

REFERENCES

Adam, S., & Expert, U. B. (2008). Learning outcomes current developments in europe: update on the issues and applications of learning outcomes associated with the Bologna process. In *Bologna Seminar: Learning Outcomes Based Higher Education: The*

Scottish Experience, 21-22 February 2008, at Heriot-Watt University, Edinburgh, Scotland.

- Arsyad, A. (2014). *Media Pembelajaran*. Jakarta: PT Raja Grafindo Persada.
- Baker, S. C. (2014). Making it work for everyone: HTML5 and CSS level 3 for responsive, accessible design on your library's web site. *Journal of Library & Information Services in Distance Learning*, 8(3-4), 118-136.
- Benson, P., & Voller, P. (1997). *Autonomy and Independence in Language Learning*. New York: Routledge.
- Bharathi, P. (2014). Self-directed learning and learner autonomy in english language teacher education : emerging trends. *International Journal for Teachers of English*, 4(1), 1-9.
- Brooks, S., Dobbins, K., Scott, J. J. A., Rawlinson, M., & Norman, R. I. (2014). Learning about learning outcomes: the student perspective. *Teaching in Higher Education*, 19(6), 721-733.
- Chen, C. M. (2009). Personalized e-learning system with self-regulated learning assisted mechanisms for promoting learning performance. *Expert Systems with Applications*, 36(5), 8816-8829.
- Chen, E. Y., Tan, C. M., Kou, Y., Duan, Q., Wang, Z., Meirelles, G. V., & Clark, N. R. (2013). Enrichr: interactive and collaborative HTML5 gene list enrichment analysis tool. *BMC Bioinformatics*, 14(1), 128.
- Curran, K., Bond, A., & Fisher, G. (2012). HTML5 and the mobile web. *International Journal of Innovation in the Digital Economy*, 3(2), 40-56.
- Donovan, W. J., & Nakhleh, M. B. (2001). Research : science and education students' use of web-based tutorial materials and their understanding of chemistry concepts. *Journal of Chemical Education*, 78(7), 975-980.
- Frailich, M., Kesner, M., & Hofstein, A. (2007). The influence of web-based chemistry learning on students' perceptions, attitudes, and achievements. *Research in Science & Technological Education*, 25(2), 179-197.
- Garaizar, P., Vadillo, M. A., & López-De-Ipiña, D. (2014). Presentation accuracy of the web revisited: animation methods in the HTML5 era. *PLoS ONE*, 9(10), 1-20.
- Grabau, L. J., & Ma, X. (2017). Science engagement and science achievement in the context of science instruction: a multilevel analysis of U.S. students and schools. *International Journal of Science Education*, 693(April), 1-24.
- Hake, R. R. (1998). Interactive-engagement versus traditional methods: a six-thousand-student survey of mechanics test data for introductory physics courses. *American Journal of Physics*, 66(1), 64-74.
- Hamalik, O. (2011). *Kurikulum dan Pembelajaran*. Jakarta: Bumi Aksara.
- Kay, R. (2014). Exploring the use of web-based learning tools in secondary school classrooms. *Interactive Learning Environments*, 22(1), 67-83.
- Kennedy, D., Hyland, Á., & Ryan, N. (2006). *Writing and Using Learning Outcomes : a Practical Guide*. Ireland: University College Cork.
- Kusairi, S., Alfad, H., & Zulaikah, S. (2016). Development of web-based intelligent tutoring (*iTutor*) to help students learn fluid statics. *Journal of Turkish Science Education*, 14(2), 1-11.
- Lee, S. W. Y., & Tsai, C. C. (2011). Students' perceptions of collaboration, self-regulated learning, and information seeking in the context of Internet-based learning and traditional learning. *Computers in Human Behavior*, 27(2), 905-914.
- Lubbers, P., Albers, B., Salim, F., & Pye, T. (2011). *Pro HTML5 programming* (2nd ed.). New York: Springer Science Business Media.
- Mardapi, D. (2008). *Teknik Penyusunan Instrumen Tes dan Nontes*. Yogyakarta: Mitra Cendikia Press.

- Marini, J. A. da S., & Boruchovitch, E. (2014). Self-regulated learning in students of pedagogy. *Paidéia (Ribeirão Preto)*, 24(59), 323–330.
- Nafidi, Y., Alami, A., Zaki, M., El Batri, B., & Afkar, H. (2017). Impacts of the use of a digital simulation in learning earth sciences (the case of relative dating in high school). *Journal of Turkish Science Education*, 15(1), 89–108.
- Økland, G. M. (2012). Determinants of learning outcome for students at high school in Norway: a constructivist approach. *Scandinavian Journal of Educational Research*, 56(2), 119–138.
- Pintrich, P., & Zusho, A. (2002). The development of academic self-regulation: The role of cognitive and motivational factors. In *Development of Achievement Motivation* (pp. 249–284). San Diego, CA: Academic.
- Rusman. (2013). *Belajar dan Pembelajaran Berbasis Komputer: Mengembangkan Profesionalisme Guru Abad 21*. Bandung: Alfabeta.
- Sadiman, A. S., Rahardjo, R., Haryono, A., & Harjito. (2014). *Media Pendidikan*. Jakarta: PT Raja Grafindo Persada.
- Schunk, D. H. (2005). Self-regulated learning: the educational legacy of Paul R. Pintrich. *Educational Psychologist*, 40(2), 85–94.
- Shih, K.-P., Chen, H.-C., Chang, C.-Y., & Kao, T.-C. (2010). The development and implementation of scaffolding-based self-regulated learning system for e/m-Learning. *Educational Technology & Society*, 13(1), 80–93.
- Sikos, L. (2011). *Web standards: mastering HTML5, CSS3, and XML*. A press. New York: Springer Science Business Media.
- Tsai, C.-W., Hsu, P.-F., & Tseng, H.-J. (2013). Exploring the effects of web-mediated game-based learning and self-regulated learning on students' learning. *International Journal of Information & Communication Technology Education*, 9(2), 39–51.
- UNESCO. (2015). *Global Citizenship Education Topics and Learning Objectives*. France: The United Nations Educational, Scientific, and Cultural Organization.
- Wan, Z., Compeau, D., & Haggerty, N. (2012). The effects of self-regulated learning processes on e-Learning outcomes in organizational settings. *Journal of Management Information Systems*, 29(1), 307–340.
- Wang, S.-L., & Wu, P.-Y. (2008). The role of feedback and self-efficacy on web-based learning: The social cognitive perspective. *Computers and Education*, 51(4), 1589–1598.
- Winters, F. I., Greene, J. A., & Costich, C. M. (2008). Self-regulation of learning within computer-based learning environments: a critical analysis. *Educational Psychology Review*, 20(4), 429–444.
- Yektyastuti, R., & Ikhsan, J. (2016). Pengembangan media pembelajaran berbasis android pada materi kelarutan untuk meningkatkan performa akademik siswa SMA. *Jurnal Inovasi Pendidikan IPA*, 2(1), 88–99.
- Yen, H. C., Tuan, H. L., & Liao, C. H. (2011). Investigating the influence of motivation on students' conceptual learning outcomes in web-based vs. classroom-based science teaching contexts. *Research in Science Education*, 41(2), 211–224.
- Zimmerman, B. J. (2008). Investigating self-regulation and motivation: historical background, methodological developments, and future prospects. *American Educational Research Journal*, 45(1), 166–183.
- Zimmerman, B. J., & Tsikalas, K. E. (2005). Can computer-based learning environments (CBLEs) be used as self-regulatory tools to enhance learning?. *Educational Psychologist*, 40(4), 267–271.