

**DIGITAL SCRAPBOOK LEARNING ON ENVIRONMENTAL
POLLUTION BY USING CANVA TO CONSTRUCT
STUDENTS' SCIENTIFIC LITERACY AND
COMMUNICATION SKILL**

Research Paper

Submitted as Requirement to Obtain Degree of *Sarjana Pendidikan* in
International Program on Science Education (IPSE) Study Program



Arranged by:

Iga Putri Adipati

1500169

**INTERNATIONAL PROGRAM ON SCIENCE EDUCATION
FACULTY OF MATHEMATICS AND SCIENCE EDUCATION
UNIVERSITAS PENDIDIKAN INDONESIA**

2019

**DIGITAL SCRAPBOOK LEARNING ON ENVIRONMENTAL
POLLUTION BY USING CANVA TO CONSTRUCT
STUDENTS' SCIENTIFIC LITERACY AND
COMMUNICATION SKILL**

Arranged by:
Iga Putri Adipati

Submitted as Requirement to Obtain Degree of Sarjana Pendidikan in
International Program on Science Education (IPSE) Study Program

© Iga Putri Adipati
Universitas Pendidikan Indonesia
August 2019

Copyright reserved

This thesis may not reproduce in whole in a part, reprinted, copied, or
any other means without the permission of the author


APPROVAL SHEET

**DIGITAL SCRAPBOOK LEARNING ON ENVIRONMENTAL
POLLUTION BY USING CANVA TO CONSTRUCT STUDENTS'
SCIENTIFIC LITERACY AND COMMUNICATION SKILL**

By:
Iga Putri Adipati
1500169

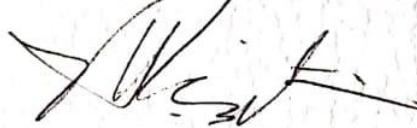
Approved and Authorized by:

Supervisor I



Prof. Dr. Anna Permanasari, M.Si
NIP. 195807121983032002

Supervisor II



Rika Rafikah Agustin, M.Pd.
NIP. 198308032012122001

Head of International Program on Science Education Study Program



Dr. Eka Cahya Prima, S.Pd., M.T.
NIP. 199006262014041001

DECLARATION

I hereby declare that the research paper entitled “Digital Scrapbook Learning on Environmental Pollution by Using Canva to Construct Students’ Scientific Literacy and Communication Skill” is genuinely pure result of my own original ideas, efforts, research, work, and not copy or plagiarized from other papers. The opinions of findings from the expert or others contained on this paper have been quoted or referenced is in accordance with ethical science that applied in scholarly society. The declaration is created truthfully and consciously, if later it is found that there is scientific ethics violation or claims from other parties regarding my work, I am willing to responsible and accept academical sanctions correspond to applicable rules.

Bandung, August 2019

Declarant,

Iga Putri Adipati

NIM. 1500169

DIGITAL SCRAPBOOK LEARNING ON ENVIRONMENTAL POLLUTION BY USING CANVA TO CONSTRUCT STUDENTS' SCIENTIFIC LITERACY AND COMMUNICATION SKILL

Iga Putri Adipati

International Program on Science Education

igaputriad@gmail.com

ABSTRACT

The 21st century skills must be possessed by students. Technology, scientific literacy and communication skill must also be owned by students to survive in digital era. The aim of this study is to capture and investigate the learning process, students' scientific literacy, and communication skill after learning environmental pollution by using digital scrapbook via canva website. The method used in this study was descriptive method with non-experimental design. The research subject was 7th grade students of Ar-Rafi Drajat Junior High School, which has already implemented national curriculum 2013 and uses digital assistance. There were 31 students involved in this research. The learning profile was pictured on using observation sheet, meanwhile the objective test was used to measure students' scientific literacy as data for supporting the learning profile. The communication skill was observed through a rubric and learner satisfaction on using canva website was gained using a questionnaire. As the impact of a good learning profile, the students' achievement on scientific literacy shows the good result as well as the communication skill. It can be concluded that digital scrapbook learning by using canva website is able to endorse students' scientific literacy and communication skill in learning environmental pollution.

Key words: Digital Scrapbook, Students' Scientific Literacy, Students' Communication Skill, Environmental Pollution.

**PEMBELAJARAN *SCRAPBOOK* DIGITAL MENGENAI POLUSI
LINGKUNGAN DENGAN MENGGUNAKAN CANVA UNTUK
MEMBANGUN LITERASI SAINS SISWA DAN KETERAMPILAN
KOMUNIKASI**

Iga Putri Adipati

International Program on Science Education

igaputriad@gmail.com

ABSTRAK

Keterampilan abad ke-21 harus dimiliki oleh siswa. Teknologi, literasi sains, dan keterampilan komunikasi juga harus dimiliki oleh siswa agar dapat bertahan di era digital. Tujuan dari penelitian ini adalah untuk mengetahui dan menyelidiki proses pembelajaran, kemampuan literasi sains, dan keterampilan komunikasi siswa setelah mempelajari polusi lingkungan dengan menggunakan *scrapbook* digital melalui situs web canva. Metode yang digunakan dalam penelitian ini adalah metode deskriptif dengan desain non-eksperimental. Subjek penelitian adalah siswa kelas 7 SMP Ar-Rafi Drajat, yang telah menerapkan kurikulum nasional 2013 dan menggunakan bantuan digital. Dalam penelitian ini, terdapat 31 siswa yang terlibat. Profil pembelajaran diperoleh menggunakan lembar observasi, sedangkan tes objektif digunakan untuk mengukur kemampuan literasi sains siswa sebagai data untuk mendukung profil pembelajaran. Keterampilan komunikasi diamati melalui rubrik dan kepuasan pelajar dalam menggunakan situs web canva diperoleh dengan menggunakan kuesioner. Sebagai dampak dari profil pembelajaran yang baik, pencapaian siswa dalam literasi sains menunjukkan hasil yang baik, demikian juga dengan keterampilan berkomunikasi. Dapat disimpulkan bahwa pembelajaran *scrapbook* digital dengan menggunakan situs web canva dapat mendukung kemampuan literasi sains dan komunikasi siswa dalam mempelajari polusi lingkungan.

Kata kunci: *Scrapbook* Digital, Literasi Sains Siswa, Keterampilan Komunikasi Siswa, Polusi Lingkungan

PREFACE

All praise belongs to Allah SWT because of His Mercy and Grace, the author could finish the research paper entitled “Digital Scrapbook Learning on Environmental Pollution by Using Canva to Construct Students’ Scientific Literacy and Communication Skill”. *Salawat* and *Salaam* might be sent upon the prophet Muhammad, the last of His Messengers and prophet, his family, companions, and all those who follow his steps till the end of the time.

The research paper is the last requirement to obtain *Sarjana* in University. As a part of millennial generation, the author concerned about learning activities that could provide a platform in order to enhance students’ competencies and skill especially in scientific literacy and communication. Through this research paper, author is willing to describe the research that has been conducted by the author. The description is divided into five chapters consist of introduction; literature review; research methodology; result and discussion; and conclusion and recommendation.

The perfection belongs to Allah. The author realizes that there are many weaknesses or limitations that need to be fixed and improved. Thus, suggestions, comments, and recommendations are openly welcomed for the better quality of learning process. Hopefully, this research can be useful for science education and can be a reference for the better learning and teaching implementation.

Bandung, August 2019

Iga Putri Adipati

ACKNOWLEDGEMENT

The completion of this research paper is not spared from the help of various parties in so many ways to the author. Therefore, in this opportunity the author would like to express the deepest thank you and highest appreciation to the following:

- 1) Prof. Dr. Anna Permanasari, M.Si. as my first supervisor who has given me remarkable knowledge, guidance, encouragement, warm appreciation and motivation all the time to finish writing the research paper.
- 2) Mrs. Rika Rafikah Agustin, M.Pd. as my second supervisor who always gives me the best suggestions, motivates me, gives positive energy and always cheers me up. Thank you so much Mrs.
- 3) Dr. Diana Rochintaniawati, M.Ed. as my PPL supervisor who always honest, open minded, and give me courage and motivation when i was needed it the most throughout PPL.
- 4) Dr. Eka Cahya Prima, S.Pd., M.T. as the head of International Program on Science Education Study Program. Thank you for acknowledging this research.
- 5) The lecturers of International Program on Science Education study program especially Mrs. Lilit, Mrs. Resik, and Mr Latif. Thank you all so much for kindness and patience.
- 6) Students of SMP Ar-Rafi Drajat grade 7 to 8, the class of Sutayta Al-Mahamali, Ummu Muthiah, Ibnu Sina, and Ibnu Rusyd. Especially for Zsabian, Dhafin, and Najla, I am so blessed to have you as a brother and sister. Thank you for all the moments, love, tears, and being the best part in the end of my college year.
- 7) Dearest Mommy, Bule, and my big family. Thank you for all the prayers and supports.
- 8) Slayinclass IPSE 2015. Thank you for all the love, memories, struggles, drama, and sleepless nights in my 4 years life. We made it, like always.

- 9) Melioris; Inez, Nadi, Dyana, Tania, and Dini who always gave me support and great suggestions. Thank you for reminding me not to give up, striving for excellence, reminding me that the world is big and there are so many opportunities to get as long as you work for it. See you on top!
- 10) My dearest girls; Atika, Nisa, Nadia, and Eksa. Thank you for being there for me whenever and wherever, always motivate me, cheer me up, and thanks for prayers that you all gave me.
- 11) Beloved bestfriends, Handina, Gita, and Reinald. Thank you for being the best support system from day one, thank you for helping me got through my college life, physically and mentally. You all are my person and the best company anyone could have asked for. May Allah always keep you safe so that we may meet again. I love you.

CONTENTS

APPROVAL SHEET	i
DECLARATION	ii
ABSTRACT	iii
PREFACE	v
ACKNOWLEDGMENT	vi
CONTENTS	viii
LIST OF TABLES	x
LIST OF FIGURES	xii
LIST OF APPENDIX	xiii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Research Problem.....	4
1.3 Research Question	4
1.4 Limitation of Problem	4
1.5 Research Objective.....	5
1.6 Research Benefit.....	5
1.7 The Organization of Research Paper	6
CHAPTER II LITERATURE REVIEW	8
2.1 Digital Scrapbook.....	8
2.2 Canva.....	10
2.3 Students’ Scientific Literacy	13
2.4 Students’ Communication Skill.....	15
2.5 Environmental Pollution.....	17
2.6 Relevant Research	22

CHAPTER III RESEARCH METHODOLOGY	27
3.1 Research Method and Research Design	27
3.2 Research Subject	27
3.3 Operational Definition.....	28
3.4 Research Instrument	29
3.5 Instrument Analysis Result	39
3.6 Data Analysis	43
3.7 Research Procedure	44
CHAPTER IV RESULT AND DISCUSSION.....	47
4.1 Research Result and Discussion.....	47
4.1.1 Implementation of Learning Activities	47
4.1.2 Students' Scientific Literacy	52
4.1.3 Students' Communication Skill.....	58
4.1.4 The Relation between Students' Scientific Literacy and Students' Communication Skill.....	65
4.1.5 Learner Satisfaction in Using Canva Website.....	67
CHAPTER V CONCLUSION AND RECOMMENDATION.....	69
5.1 Conclusion.....	69
5.2 Recommendation.....	70
REFERENCES.....	71
APPENDICES	78
AUTOBIOGRAPHY	177

LIST OF TABLES

Table 2.1 Analysis of Core Competence and Basic Competence on Environmental Pollution	17
Table 2.2 Journal Analysis of Teaching Children Digital Literacy Through Design-based Learning with Digital Toolkits in Schools	22
Table 2.3 Journal Analysis of Engaging Students in Learning Science Through Promoting Creative Reasoning	23
Table 2.4 Journal Analysis of Impact of Secondary Students' Content Knowledge on Their Communication Skills in Science.....	24
Table 2.5 Journal Analysis of Observed learning outcomes of integrated communication training in science education: skills and subject matter understanding	25
Table 2.6 Journal Analysis of Teachers' Adaptive Instruction Supporting Students' Literacy Learning	26
Table 3.1 Observation Sheet	29
Table 3.2 Blue Print of Environmental Pollution Objective Test	31
Table 3.3 Validity interpretation	32
Table 3.4 Reliability Interpretation	32
Table 3.5 Category of Difficulty Level.....	33
Table 3.6 Rubric of Students' Communication Skill.....	34
Table 3.7 Questionnaire of Learner Satisfaction.....	38
Table 3.8 Test Item Specification	40
Table 3.9 The Recapitulation of Test Items' Analysis.....	40
Table 3.10 Students' Communication Skill Scoring Criteria	44
Table 3.11 Correlation Test Criteria	44
Table 4.1 Result of Digital Based Learning Implementation on Environmental Pollution Topic	47
Table 4.2 The Results of Environmental Pollution Test	52
Table 4.3 The Average Score Result of Students' Scientific Literacy	53
Table 4.4 Students Communication Skill Result on Verbal Communication Activities	62

Table 4.5 Students Communication Skill Result on Visual Communication	
Activities	64
Table 4.6 Correlation Test Criteria	66
Table 4.7 Result of Learner Satisfaction in Using Canva Website.....	67

LIST OF FIGURES

Figure 2.1 Scrapbook	9
Figure 2.2 Canva Website	11
Figure 2.3 Canva Features.....	11
Figure 2.4 Designing Space	12
Figure 2.5 Designing Features	12
Figure 3.1 Flowchart of Research Procedure	46
Figure 4.1 The Average Score Result of Students' Scientific Literacy	53
Figure 4.2 Question in a Test Item on Attitude Indicator	54
Figure 4.3 Result on a Test Item in Attitude Indicator	54
Figure 4.4 Question in a Test Item on Competencies Indicator.....	55
Figure 4.5 Result in a Test Item on Competencies Indicator	55
Figure 4.6 Question in a Test Item on Concept Indicator	56
Figure 4.7 Result in a Test Item on Concept Indicator	56
Figure 4.8 Students' Communication Skill Result on Verbal Communication Competency.....	59
Figure 4.9 Students' Communication Skill Result on Visual Communication Competency.....	60
Figure 4.10 Students' Communication Skill Result on Verbal Communication Activities	62
Figure 4.11 Students' Communication Skill Result on Visual Communication Activities	64
Figure 4.12 The Correlation Test Result.....	65

LIST OF APPENDIX

APPENDIX A. INSTRUCTIONAL TOOLS

Appendix A.1 Lesson Plan.....	79
Appendix A.2 Canva Website.....	88

APPENDIX B. RESEARCH INSTRUMENT

Appendix B.1 Form of Validation	92
Appendix B.2 Observation Sheet.....	95
Appendix B.3 Instrument of Students' Scientific Literacy.....	99
Appendix B.4 Instrument of Students' Communication Skill.....	124
Appendix B.5 Instrument of Students' Satisfaction.....	129

APPENDIX C. RESULT OF RESEARCH DATA

Appendix C.1 Recapitulation of Students' Learning Process.....	131
Appendix C.2 Recapitulation of Students' Scientific Literacy.....	134
Appendix C.3 Recapitulation of Students' Communication Skill.....	135
Appendix C.4 Recapitulation of Students' Satisfaction.....	144

APPENDIX D. ADMINISTRATION

Appendix D.1 Research Permission Letter	149
Appendix D.2 Research Implementation Letter.....	150

APPENDIX E. DOCUMENTATION

Appendix E.1 Documentation of Digital Scrapbook Learning by Using Canva Website on Environmental Pollution Topic.....	152
--	-----

APPENDIX F. REVISION

Appendix F.1 Review Form.....	156
Appendix F.2 Thesis Revision Form	157
Appendix F.3 Turnitin Thesis Revision.....	160

REFERENCES

- Adams, K. (2005). *The Sources of Innovation and Creativity*. Washington: National Center on Education and the Economy (NJ1).
- APJII. (2018). The Number of Indonesian Internet Users has Increased in 2017. [Online] Retrieved from <https://www.infrastructureasiaonline.com/new-technology> [Accessed on November 3rd, 2018]
- Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta
- Aufderheide, P. (1993). *Media Literacy. A Report of the National Leadership Conference on Media Literacy*. ERIC.
- Barge, S. (2018). Impact of Guest Lectures on Development of Communication Skill of Rural School going Students. *Global Journal for Research Analysis*, 6(12).
- Bekker, T., Bakker, S., Douma, I., Van Der Poel, J., & Scheltenaar, K. (2015). Teaching children digital literacy through design-based learning with digital toolkits in schools. *International Journal of Child-Computer Interaction*, 5, 29-38.
- Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. *The clearing house*, 83(2), 39-43.
- Blanchard, R. O., & Christ, W. G. (1993). *Media education and the liberal arts: A blueprint for the new professionalism*. New Jersey: Lawrence Erlbaum Associates.
- Blumenfeld, P. C., Soloway, E., Marx, R. W., Krajcik, J. S., Guzdial, M., & Palincsar, A. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26(3-4), 369-398.
- Bricker, L. A., & Bell, P. (2008). Conceptualizations of argumentation from science studies and the learning sciences and their implications for the practices of science education. *Science Education*, 92(3), 473-498.
- Bucchi, M., & Trench, B. (2008). *Handbook of public communication of science and technology*. Abingdon: Routledge.
- Buck, R., & VanLear, C. A. (2002). Verbal and nonverbal communication: Distinguishing symbolic, spontaneous, and pseudo-spontaneous nonverbal behavior. *Journal of communication*, 52(3), 522-541.

- Buckingham, D. (2010). Defining digital literacy. In *Medienbildung in neuen Kulturräumen* (pp. 59-71). VS Verlag für Sozialwissenschaften.
- Buckingham, D., & Sefton-Green, J. (2005). *Cultural studies goes to school*. London: Taylor & Francis.
- Canva (2018). Getting Started: What is Canva?. [Online] Retrieved from <https://support.canva.com/getting-started-1/> [Accessed on November 15th, 2018]
- Cass, D. (2004, May 17). Memorial days. *Slate*. [Online] Retrieved from <http://www.slate.com> [Accessed on November 15th, 2018]
- Cohen, L., Manion, L., & Morrison, K. (2002). *Research methods in education*. Abingdon: Routledge.
- Corrin, L., Lockyer, L., & Bennett, S. (2010). Technological diversity: An investigation of students' technology use in everyday life and academic study. *Learning, Media and Technology*, 35(4), 387-401.
- Craft & Hobby Association. (2010). Getting your scrap on for National Scrapbooking Day. Retrieved from <http://craftandhobby.wordpress.com/2010/04/28/getting-your-scrap-on-for-national-scrapbooking-day/> [Accessed on November 15th, 2018]
- Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*. Boston: Cengage Learning.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297-334.
- Cronje, R., Murray, K., Rohlinger, S., & Wellnitz, T. (2013). Using the science writing heuristic to improve undergraduate writing in biology. *International Journal of Science Education*, 35(16), 2718-2731.
- Dunbar, N. E., Brooks, C. F., & Kubicka-Miller, T. (2006). Oral communication skills in higher education: Using a performance-based evaluation rubric to assess communication skills. *Innovative Higher Education*, 31(2), 115.
- Education First. (2018). English Proficiency Index. [Online]. Retrieved from <https://www.ef.co.id/epi/>. [Accessed on November 15, 2018]
- Emig, J. (1977). Writing as a mode of learning. *College composition and communication*, 28(2), 122-128.

- Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2011). How to design and evaluate research in education: New York: McGraw-Hill Humanities/Social Sciences/Languages.
- Gee J. P. (1998). Negotiating academic literacies: Teaching and learning across languages and cultures. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.
- George, R., Joy, V., Aiswarya, S., & Jacob, P. (2014). Treatment methods for contaminated soils—translating science into practice. *International Journal of Education and applied research*, 4.
- Goldenberg, C., & Gallimore, R. (1991). Classroom discourse: The language of teaching and learning. Portsmouth, New Hampshire: Heinemann.
- Good, K. D. (2013). From scrapbook to Facebook: A history of personal media assemblage and archives. *New Media & Society*, 15(4), 557-573.
- Goodrum, D., Rennie, L., & Hackling, Mark. (2001). Science Teaching and Learning in Australian Schools: Results of a National Study. *ECU Publications*. 31. 10.1023/A:1013171905815.
- Helfand, J. (2008). Scrapbooks: An American History. New Haven: Yale University Press.
- Hoban, G., Loughran, J., & Nielsen, W. (2011). Slowmation: Preservice elementary teachers representing science knowledge through creating multimodal digital animations. *Journal of research in science teaching*, 48(9), 985-1009.
- Jacobson-Lundeberg, V. (2016). Pedagogical Implementation of 21st Century Skills. *Educational Leadership and Administration: Teaching and Program Development*, 27, 82-100.
- JISC (2014). Developing Digital Literacy. [Online]. Retrieved from <https://www.jisc.ac.uk/> [Accessed on November 15, 2018]
- Johnson, M. B. (1999). Communication in the Classroom.
- Kaplan, R. M., & Saccuzzo, D. P. (2017). Psychological testing: Principles, applications, and issues. Scarborough: Nelson Education.
- Kim, B., & Reeves, T. C. (2007). Reframing research on learning with technology: In search of the meaning of cognitive tools. *Instructional science*, 35(3), 207-256.
- Kohut, M. (2011). Making art from memories: Honoring deceased loved ones through a scrapbooking bereavement group. *Art Therapy*, 28(3), 123-131.

- Kozma, R. B. (2012). The Use of Multiple Representations and the Social Construction of Understanding in Chemistry Innovations in science and mathematics education (pp. 24-59). Abingdon: Routledge.
- Kulgemeyer, C. (2018). Impact of secondary students' content knowledge on their communication skills in science. *International Journal of Science and Mathematics Education*, 16(1), 89-108.
- Kwakman, K. (2003). Factors affecting teachers' participation in professional learning activities. *Teaching and Teacher Education*, 19(2), 149-170.
- Lee, O., & Fradd, S. H. (1996). Literacy skills in science learning among linguistically diverse students. *Science Education*, 80(6), 651-671.
- Maddison, J. (1971). Radio and Television in Literacy: A Survey of the Use of Broadcasting Media in Combating Illiteracy among Adults. Paris: UNESCO
- McMillan, J. H., & Schumacher, S. (1984). Research in education: A conceptual introduction. Harlow: Pearson Longman..
- Millar, R. (2005). Scientific literacy: Can the school science curriculum deliver. *Communicating European research*. Springer, Dordrecht, the Netherlands, 143-148.
- Miller, P. W. (1988). Nonverbal Communication. What Research Says to the Teacher. Washington: National Education Association.
- Moeller, S., Joseph, A., Lau, J., & Carbo, T. (2011). Towards media and information literacy indicators. Paper presented at the *Background document of the UNESCO Expert Meeting* (Bangkok, Thailand, 4-6 November 2010).
- Moore, R. (2000). Writing about biology: How rhetorical choices can influence the impact of a scientific paper. *Bioscene*, 26(1), 23-25.
- Moss, B. (2007). Water pollution by agriculture. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 363(1491), 659-666.
- Motegi, R., Kanematsu, Y., Tsuchida, T., Mikami, K., & Kondo, K. (2016). Color scheme scrapbook using a character color palette template. *Journal for Geometry and Graphics*, 20(1), 115-126.
- Müller, M. G. (2007). What is visual communication? Past and future of an emerging field of communication research. *Studies in Communication Sciences*, 7(2).

- Nottingham Trent University. (2017). Developing Literacy at NTU. [Online]. Retrieved from <https://now.ntu.ac.uk/d2l/lor/viewer/viewFile.d2lfile/6605/62975/Digital%20Literacy/05Creativity.html>. [Accessed on November 15, 2018]
- OECD. (1999). Programme for International Student Assessment (PISA) 1999 Draft Frameworks. [Online] Retrieved from <http://www/oecd.org/> [Accessed on March 3rd, 2019]
- OECD. (2013). Programme for International Student Assessment (PISA) 2012 Draft Frameworks. [Online] Retrieved from <http://www/oecd.org/> [Accessed on November 3rd, 2018]
- Pahl, K., & Rowsell, J. (2012). Literacy and education. California: SAGE Publications Ltd
- Panagos, P., Van Liedekerke, M., Yigini, Y., & Montanarella, L. (2013). Contaminated sites in Europe: review of the current situation based on data collected through a European network. *Journal of Environmental and Public Health*, 2013.
- Pelger, S., & Nilsson, P. (2016). Popular science writing to support students' learning of science and scientific literacy. *Research in Science Education*, 46(3), 439-456.
- Pelger, S., & Nilsson, P. (2018). Observed learning outcomes of integrated communication training in science education: skills and subject matter understanding. *International Journal of Science Education, Part B*, 8(2), 135-149.
- PISA (2018). Indonesia's PISA results show need to use education resources more efficiently.[Online].Retrieved from <http://theconversation.com/indonesias-pisa-results-show-need-to-use-education-resources-more-efficiently-68176> [Accessed on November 15, 2018]
- Reid, A., & Petocz, P. (2004). Learning domains and the process of creativity. *The Australian Educational Researcher*, 31(2), 45-62.
- Rennie, L. (2005). Science Awareness and Scientific Literacy. Teaching Science. *The Journal of the Australian Science Teachers Association*, 51 (1), pp. 10-14
- Saccuzzo, D., & Kaplan, R. (2004). Psychological testing: Principles, applications, and issues. San Francisco: Wadsworth Publishing Co.
- Sheal, P. (1989). Classroom observation: training the observers. *ELT journal*, 43(2), 92-104.

- Sholle, D., & Denski, S. (1995). Chapter I: Critical Media Literacy: Reading, Remapping, Rewriting. *Counterpoints*, 4, 7-31.
- Skills, C. (2003). *Literacy in the Digital Age*. Naperville, Illinois: NCREL.
- Spengler, J. D., & Sexton, K. (1983). Indoor air pollution: a public health perspective. *Science*, 221(4605), 9-17.
- Stein, M. K., & Wang, M. C. (1988). Teacher development and school improvement: The process of teacher change. *Teaching and Teacher Education*, 4(2), 171-187.
- Suryadi, E. (2016). Pentingnya Kreativitas dalam Meningkatkan Mutu Pendidikan. [Online]. Retrieved from <https://now.ntu.ac.uk/d21/lor/viewer/viewFile.d21file/6605/62975/Digital%20Literacy/05Creativity.html>. [Accessed on November 15, 2018]
- Turiman, P., Omar, J., Daud, A. M., & Osman, K. (2012). Fostering the 21st century skills through scientific literacy and science process skills. *Procedia-Social and Behavioral Sciences*, 59, 110-116.
- UNESCO. (2018). *Education Transforms Lives*. [Online] Retrieved from <https://en.unesco.org/themes/education> [Accessed on May 9th, 2019]
- Vaughn, M., Parsons, S. A., Gallagher, M. A., & Branen, J. (2016). Teachers' adaptive instruction supporting students' literacy learning. *The Reading Teacher*, 69(5), 539-547.
- Wahlström, N. (2010). Learning to communicate or communicating to learn? A conceptual discussion on communication, meaning, and knowledge. *Journal of Curriculum Studies*, 42(4), 431-449.
- Waldrip, B., & Prain, V. (2017). Engaging students in learning science through promoting creative reasoning. *International Journal of Science Education*, 39(15), 2052-2072.
- Wang, Y.-S. (2003). Assessment of learner satisfaction with asynchronous electronic learning systems. *Information & Management*, 41(1), 75-86.
- Weaver, C. (1998). *Reconsidering a balanced approach to reading*. Illinois: Natl Council of Teachers of English.
- West, L. (2006). *World Water Day: A Billion People Worldwide Lack Safe Drinking Water*, New York, NY: About. com: Inc.
- White, T. (2005). *The encyclopedia of scrapbooking*: Primedia Scrapbooking.

- Wittwer, J., & Renkl, A. (2008). Why instructional explanations often do not work: A framework for understanding the effectiveness of instructional explanations. *Educational Psychologist*, 43(1), 49-64.
- Wittwer, J., Nückles, M., Landmann, N., & Renkl, A. (2010). Can tutors be supported in giving effective explanations? *Journal of Educational Psychology*, 102(1), 74.
- Worth, S., Gross, L., & Gross, L. P. (1981). Studying visual communication. Philadelphia: University of Pennsylvania Press.