THE IMPLEMENTATION OF DISCOVERY LEARNING BY USING SCREENCAST-O-MATIC APPLICATION ON STUDENTS' CRITICAL THINKING AND COMMUNICATION SKILLS IN LEARNING CLIMATE CHANGE

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ABSTRACT

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Digital competence is a new ability for educators and students in 21st century learning. Digital competence involves the confident critical use of information and communication ability. The purpose of this research was to investigated students' critical thinking and communication skills by implementing discovery learning by using screencast-o-matic application in learning climate change. This research is pre-experimental method with one group pre-test post-test design. Pre-test and post-test was used as data collection tools. The participant of this study were seventh grade students which consists of 26 students from one of junior high school in Bandung. The data of students' critical thinking ability concluded there is improvement on students' critical thinking skills after treatment. N-gain score of critical thinking skills obtained 0.46, which is interpreted as medium improvement. The highest improvement is in Practicing Thinker category and the lowest improvement is in Advance Thinker category. Whereas, the data of students' communication skills resulted there is enhancement between pre-test and post-test. N-gain score of communication skills obtained 0.21, which is interpreted as low improvement. The most improvement is in Proficient category and the lowest improvement is in Basic category. The correlation between students' critical thinking and communication skills obtained strong correlation category with the coefficient correlation of 0.716. Therefore, discovery learning by using screencast-o-matic can be used to gain students' critical thinking and communication skills.

Keywords: Discovery Learning, Screencast-O-Matic Application, Critical Thinking Skills, Communication Skills, Climate Change

IMPLEMENTASI PEMBELAJARAN DISCOVERY LEARNING DENGAN MENGGUNAKAN APLIKASI SCREENCAST-O-MATIC TERHADAP KEMAMPUAN BERPIKIR KRITIS DAN KOMUNIKASI SISWA DALAM PEMBELAJARAN PERUBAHAN IKLIM

ABSTRAK

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Kompetensi digital merupakan kemampuan baru bagi pendidik dan peserta didik dalam pembelajaran di abad 21. Kompetensi digital melibatkan kepercayaan diri dalam penggunaan informasi dan kemampuan berkomunikasi. Tujuan penelitian ini adalah untuk menyelidiki kemampuan berpikir kritis dan komunikasi siswa dengan menerapkan pembelajaran discovery learning menggunakan aplikasi screencast-o-matic dalam pembelajaran perubahan iklim. Metode penelitian ini adalah metode pra eksperimen dengan rancangan one group pre-test post-test design. Pre-test dan post-test digunakan sebagai alat pengumpulan data. Partisipan pada penelitian ini adalah siswa kelas tujuh yang terdiri dari 26 siswa dari salah satu SMP di Bandung. Hasil data kemampuan berpikir kritis siswa dapat disimpulkan terdapat peningkatan kemampuan berpikir kritis siswa setelah diberikan perlakuan. Skor N-gain keterampilan berpikir kritis diperoleh 0,46 yang diartikan sebagai peningkatan sedang. Peningkatan tertinggi pada kategori Practicing Thinker dan peningkatan terendah pada kategori Advanced Thinker. Sedangkan data keterampilan komunikasi siswa menunjukkan adanya peningkatan antara pre-test dan post-test. Skor N-gain keterampilan komunikasi diperoleh 0,21 yang diartikan sebagai peningkatan yang rendah. Peningkatan terbesar terjadi pada kategori Proficient dan peningkatan terendah pada kategori Basic. Hubungan korelasi kemampuan berpikir kritis dan komunikasi siswa memperoleh hubungan korelasi kuat dengan hasil sebesar 0,716. Oleh karena itu, pembelajaran dengan discovery learning menggunakan aplikasi screencast-o-matic dapat digunakan untuk meningkatkan kemampuan berpikir kritis dan komunikasi siswa.

Kata Kunci: Discovery Learning, Aplikasi Screencast-O-Matic, Keterampilan Berpikir Kritis, Keterampilan Komunikasi, Perubahan Iklim

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REFERENCES

Agus, M. H. (2003). *Komunikasi intrapersonal dan interpersonal [Intrapersonal and Interpersonal Communication]*. Yogyakarta: Kanisius.

Alex, A. M., & Olubusuyi, M. F. (2013). Guided-discovery learning strategy and senior school students performance in mathematics in ejigbo, nigeria. *Journal of Education and Practice*, *4*(12), 82-90.

Alfieri, L., Brooks, P. J., Aldrich, N. J., & Tenenbaum, H. R. (2011). Does discovery-based instruction enhance learning? *Journal of educational psychology*, *103*(1), 1.

Alfi, C., Sumarmi, S., & Amirudin, A. (2016). Pengaruh Pembelajaran Geografi Berbasis Masalah Dengan Blended Learning Terhadap Kemampuan Berpikir Kritis Siswa SMA [The Effect of Learning Geography Based problem with Blended Learning on Senior High School Students' Critical Thinking Skills]. *Journal of Education: Theory, Research, and Development*, *1*(4), 597-602.

Ali, S. H., Carr, P. A., & Ruit, K. G. (2016). Validity and Reliability of Scores Obtained on Multiple-Choice Questions: Why Functioning Distractors Matter. *Journal of the Scholarship of Teaching and Learning*, *16*(1), 1-14.

Allen, T. (2002). Charting a communication pathway: Using assessment to guide curriculum development in a re-vitalized general education plan. *Communication Education*, *51*(1), 26-39.

Andrew, M. D., Cobb, C. D., & Giampietro, P. J. (2005). Verbal ability and teacher effectiveness. *Journal of teacher education*, *56*(4), 343-354.

Ariani, M. A. S., Ristiati, N. P., & Setiawan, I. G. A. N. (2014). Implementasi Model Pembelajaran Kontekstual terhadap Hasil Belajar IPA dan Ketrampilan Berpikir Kritis Siswa SMP [The Implementation of Contextual Learning Models on Science Learning Outcomes and Critical Thinking Skills of Junior High School Students]. *Journal of Science Education Ganesha*, *4*(1), 1-13.

Arends, R. I. (2008). *Learning to teach: Belajar untuk mengajar [Learning to Teach: Learning to Teach]*. Yogyakarta: Pustaka Pelajar.

Azam, M., & Kingdon, G. G. (2015). Assessing teacher quality in India. *Journal of Development Economics*, *117*, 74-83.

Barry, J., & Scantlebury, K. (2010). Using writing in the science classroom to develop critical thinking skills. *Jurnal Education*, *535*, 1-30

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.

Beyer, B. K. (1985). *Practical Strategies for the Direct Teaching of Thinking Skills*. Washington: Association for Supervision and Curriculum Development.

Bruner, J. (1977). *The Process of Education*. Cambrige: Harvard University Press.

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.

Budiningsih, A. (2005). *Belajar dan pembelajaran [Teaching and Learning]*. Jakarta: Rineka Cipta.

Bunglowala, A., & Bunglowala, A. (2015). Nonverbal communication: An integral part of teaching learning process. *International Journal of Research in Advent Technology*, *1*, 371-375.

Clevenger Jr, T. (1959). A synthesis of experimental research in stage fright. *Quarterly Journal of Speech*, *45*(2), 134-145.

Cohen, L. Manion. L., & Morrison, K. (2007). *Research Methods in Education.* United States of America: Routledge.

Cottrell, S., & Cottrell, O. S. (2005). *Developing effective analysis and argument. library.* New York: Palgrave MacMillan.

Crocker, L., & Algina, J. (2008). *Introduction to Classical and Modern Test Theory*. Ohio: Cengage Learning.

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.

Dannels, D. P. (2001). Time to speak up: A theoretical framework of situated pedagogy and practice for communication across the curriculum. *Communication Education*, *50*(2), 144-158.

Daud, F., & Hafsari, I. A. (2015). The Contribution of Critical Thinking Skills and Metacognitive Awareness on Students' Learning: Teaching Biology at Senior High School. *Modern Applied Science*, *9*(12), 143.

Depdiknas. (2005). *Landasan Teori dalam Pengembangan Metode Pengajaran pada Materi Pelatihan Terintegrasi Ilmu Pengetahuan Alam* [The Basic Theory of Development Method on Integrated Science Training Topic]. Jakarta: Depdiknas Dirjen Pendasmen Direktorat Pend. Lanjutan Pertama.

Djamarah, S. B. (1994). *Prestasi belajar dan kompetensi guru* [Learning Achievement and Teacher Competency]. Surabaya: Usaha Nasional

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), 115-128.

Dyrli, O. E., & Kinnaman, D. E. (1996). Gaining the Online Edge. Part 2: Energizing the Classroom Curriculum through Telecommunications. *Technology & Learning*, *16*(4), 65-70.

Effendy, O. U. (2009). *Komunikasi teori dan praktek* [Theory and Practical Communication]. Bandung: PT Remaja Rosdakarya.

Emig, J. (1977). Writing as a mode of learning. *College composition and communication*, *28*(2), 122-128.

Ennis, R. H. (1993). Critical thinking assessment. *Theory into practice*, *32*(3), 179-186.

Ennis, R. H. (2018). Critical thinking across the curriculum: A vision. *Topoi*, *37*(1), 165-184.

Escudero, E. B., Reyna, N. L., & Morales, M. R. (2000). The level of difficulty and discrimination power of the Basic Knowledge and Skills Examination (EXHCOBA). *Revista electrónica de investigación educativa*, *2*(1), 2.

Finken, M., & Ennis, R. H. (1993). *Illinois critical thinking essay test.* Illinois: Department of Educational Policy Studies

Fisher, A. (2007). *Critical Thinking: An Introduction.* Jakarta: Erlangga.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2011). *How to Design and Evaluate Research in Science Education*. New York: Mc. Graw Hill.

Freeley, A. J., & Steinberg, D. L. (2013). *Argumentation and debate*. USA: Cengage Learning.

Fuad, N. M., Zubaidah, S., Mahanal, S., & Suarsini, E. (2017). Improving Junior High Schools' Critical Thinking Skills Based on Test Three Different Models of Learning. *International Journal of Instruction*, *10*(1), 101-116.

Garvey, W. D., & Griffith, B. C. (1972). Communication and information processing within scientific disciplines: Empirical findings for psychology. *Information storage and retrieval*, *8*(3), 123-136.

Gasior, K. (2013). OECD: Education at a glance 2012: OECD indicators. *Sociologický časopis/Czech Sociological Review*, *49*(06), 994-997.

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* [Curriculum and Teaching Learning]. Jakarta: Bumi Aksara.

Hanafiah, N., & Suhana, C. (2010). *Konsep Strategi Pembelajaran* [The Concepts of Instructional Strategies]. Bandung: Refika Aditama.

Hapsari, S. (2016). A descriptive study of the critical thinking skills of social science at junior high school. *Journal of Education and Learning*, *10*(3), 228-234.

Hara, K., & Kim, M. S. (2004). The effect of self-construals on conversational indirectness. *International Journal of Intercultural Relations*, *28*(1), 1-18.

Hardianto, D. (2005). Media Pendidikan sebagai Sarana Pembelajaran yang Efektif [Media of Learning as Effective Teaching and Learning]. *Learning Scientific Magazine, 1*(1), 950-104.

Hashemi, S. A. The Use of Critical Thinking in Social Science Textbooks of High School: A Field Study of Fars Province in Iran. *International Journal of Instruction*, *4*(1), 64-78.

Hinkle, D. E., Wiersma, W., & Jurs, S. G. (2003). *Applied statistics for the behavioral sciences, Houghton Mifflin College Division, 3*, 663.

Hong-li, P. (2011). Effects of non-verbal communication on college English classroom teaching. *US-China Foreign Language*, *9*(8), 505-516.

Hosnan, M. (2014). *Pendekatan saintifik dan kontekstual dalam pembelajaran abad 21: Kunci sukses implementasi kurikulum 2013* [Scientific Approach and Contextual Approach in 21th Century: The Main Success of Curriculum 2013 Implementation]. Indonesia: Ghalia Press.

Howland, J. L., & Moore, J. L. (2002). Student perceptions as distance learners in Internet-based courses. *Distance education*, *23*(2), 183-195.

Iriantara, Y. (2014). *Komunikasi Pembelajaran; Interaksi Komunikatif dan Edukatif di dalam Kelas* [Communication of Education: Communicative and Educative Interaction in Classroom]. Bandung: Simbiosa Rekatama Media.

Jeon, S., & Park, J. H. (2014). Analysis of relationships of scientific communication skills, science process skills, logical thinking skills, and academic achievement level of elementary school students. *Journal of the Korean Association for Science Education*, *34*(7), 647-655.

Johnson, E. B.(2011). *Contextual Teaching dan Learning Menjadikan Kegiatan Belajar Mengajar Mengasyikkan dan Bermakna* [Contextual Teaching and Learning to Make Learning Activities More Fun and Meaningful]. Bandung: Kaifa Learning Press.

Joolingen, V.W. (1999). Cognitive tools for discovery learning. *International Journal of Artificial Intelligence in Education*, *10*, 385-397.

Kaplan, R. M., & Saccuzzo, D. P. (2017). *Psychological testing: Principles, applications, and issues.* Canada: Nelson Education.

Kealey, B. T., Holland, J., & Watson, M. (2005). Preliminary evidence on the association between critical thinking and performance in principles of accounting. *Issues in Accounting Education*, *20*(1), 33-49.

Kementerian Pendidikan dan Kebudayaan. (2014). *Implementasi kurikulum 2013* [Implementation of Curriculum 2013]. Jakarta: Kemendikbud.

Kharbach, M. (2012). *The 21st century skills teachers and student need to have.* Halifax: Creative Commons Attribution Mount Saint Vincent University.

Komalasari, K. (2010). *Pembelajaran kontekstual konsep dan aplikasi* [Contextual Learning on Learning Concept and Its Application]. Bandung: Refika Aditama.

Koponen, J., Pyörälä, E., & Isotalus, P. (2012). Comparing three experiential learning methods and their effect on medical students' attitudes to learning communication skills. *Medical Teacher*, *34*(3), 198-207.

Kosasih, E. (2014). *Strategi belajar dan pembelajaran implementasi kurikulum 2013* [Learning Strategy and Implementation of Curriculum 2013]. Bandung: Yrama Widya.

Krus, D. J., & Blackman, H. S. (1988). Test reliability and homogeneity from the perspective of the ordinal test theory. *Applied Measurement in Education*, *1*(1), 79-88.

Kulgemeyer, C., & Schecker, H. (2013). Students explaining science—assessment of science communication competence. *Research in Science Education*, *43*(6), 2235-2256.

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.

Kurniasih, I., & Sani, B. (2014). *Sukses mengimplementasikan kurikulum 2013* [Successful Implementation of Curriculum 2013]. Jakarta: Kata Pena.

Kurtz, P. F., Boelter, E. W., Jarmolowicz, D. P., Chin, M. D., & Hagopian, L. P. (2011). An analysis of functional communication training as an empirically supported treatment for problem behavior displayed by individuals with intellectual disabilities. *Research in Developmental Disabilities*, *32*(6), 2935-2942.

Lau, J. Y. (2011). *An introduction to critical thinking and creativity: Think more, think better.* New Jersey: John Wiley & Sons.

Lestari, N. W. R., Sadia, I. W., & Suma, K. (2014). Pengaruh Model Experiential Learning terhadap Keterampilan Berpikir Kritis dan Motivasi Berprestasi Siswa [The Effect of Experiential Learning Model on Students' Critical Thinking and Motivation]. *Indonesian Journal of Science Education and Learning*, *4*(1), 1-10

Maarif, S. (2016). Improving Junior High School Students' Mathematical Analogical Ability Using Discovery Learning Method. *International Journal of Research in Education and Science*, *2*(1), 114-124.

Mahmoud, A. K. A. (2014). The effect of using discovery learning strategy in teaching grammatical rules to first year general secondary student on developing their achievement and metacognitive skills. *International Journal of Innovation and Scientific Research*, *5*(2), 146-153.

Mapeala, R., & Siew, N. M. (2015). The development and validation of a test of science critical thinking for fifth graders. *SpringerPlus*, *4*(1), 1-13.

Martins, O. O., & Oyebanji, R. K. (2000). The effects of inquiry and lecture teaching approaches on the cognitive achievement of integrated science students. *Journal of Science Teachers' Association of Nigeria*, *35*, 25-30.

Mason, M. (2007). Critical thinking and learning. *Educational philosophy and theory*, *39*(4), 339-349.

Mentari, W., & Achmad, A. (2015). Pengaruh Model Discovery Learning terhadap Kemampuan Berpikir Kritis dan Hasil Belajar Siswa [the Effect of Discovery Learning Model on Student' Critical Thinking and Students' Achievement]. *Journal of Bioterdidik: Wahana Ekspresi Ilmiah*, *3*(6), 1-10.

Miller, G. A. (1951). *Language and communication.* New York: McGraw-Hill.

Minium, E. W., King, B. M., & Bear, G. (1993). *Statistical reasoning in psychology*. New Jersey: John Willey & Sons.

Myers, D. G. (2004). *Exploring psychology.* London: Macmillan.

Nathan, M. J., Koedinger, K. R., & Alibali, M. W. (2001). Expert blind spot: When content knowledge eclipses pedagogical content knowledge. In *Proceedings of the third international conference on cognitive science*, *644648.*

Nentwich, M. (2003). Cyberscience: *Research in the Age of the Internet.* Austria: Austrian Academy of Sciences Press.

Noviyanti, E., Rusdi, R., & Ristanto, R. H. (2019). Guided discovery learning based on internet and self concept: enhancing student's critical thinking in biology. *Indonesian Journal of Biology Education*, *2*(1), 7-14.

OECD. (2010). *PISA 2009 results: learning trends: changes in student performance since 2000.* Paris: OECD Publishing.

OECD. (2014). *PISA 2012 results: what students know and can do – student performance in mathematics, reading and science.* PISA: OECD Publishing.

OECD. (2016). *PISA 2015 result in focus*. PISA: OECD Publishing.

Paul, R., & Elder, L. (2009). *The miniature guide to critical thinking: Concepts and tools.* Dillon Beach, CA: Foundation for Critical Thinking.

Paul, R., & Elder, L. (2013). Critical thinking: Tools for taking charge of your professional and personal life. *Pearson Education.*

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.

Phan, H. P. (2010). Critical thinking as a self-regulatory process component in teaching and learning. *Psicothema*, *22*(2), 284-292.

Pithers, R. T., & Soden, R. (2000). Critical thinking in education: A review. *Educational research*, *42*(3), 237-249.

Prastowo, A. (2014). *Pengembangan Bahan Ajar Tematik Tinjauan Teoritis dan Praktis* [The Development of Tematic Lesson Plan on Theoritical and Practical]. Jakarta: Kencana Prenadamedia Group.

Prensky, M. (2001). Digital natives, digital immigrants. From On the Horizon. *MCB University Press*, *9*(5), 1-6.

Prince, M. J., & Felder, R. M. (2006). Inductive teaching and learning methods: Definitions, comparisons, and research bases. *Journal of engineering education*, *95*(2), 123-138.

Purwanto, N. (1990). *Psikologi Pendidikan* [Psychology on Education]. Bandung: Remaja Rosdakarya.

Richards, J. C., & Schmidt, R. W. (2013). *Longman dictionary of language teaching and applied linguistics*. United Kingdom: Routledge.

Roth, W. M., & Roychoudhury, A. (1993). The development of science process skills in authentic contexts. *Journal of Research in Science Teaching*, *30*(2), 127-152.

Rubin, R. B., & Morreale, S. P. (1996). Setting expectations for speech communication and listening. *New directions for higher education*, *1996*(96), 19-29.

Rustaman, N. Y. (2011). Pendidikan dan Penelitian Sains dalam Mengembangkan Keterampilan Berpikir Tingkat Tinggi untuk Pembangunan Karakter [Education and Research of Science in Developing High Order Thinking Skills for Character Building]. In *Prosiding Seminar Biologi*, *8*(1).

Santrock, J. W. (2014). *Psikologi pendidikan* [Psychology of Education]. Jakarta: Salemba Empat.

Sapriya, P. I. (2012). *Konsep dan Pembelajaran* [Concept and Learning]. Bandung: Remaja Rosdakarya.

Schreiber, L. M., Paul, G. D., & Shibley, L. R. (2012). The development and test of the public speaking competence rubric. *Communication Education*, *61*(3), 205-233.

Schwartz, S., & Miller, J. E. H. (1988). *The Language of Toys: Teaching Communication Skills to Special-needs Children: a Guide for Parents and Teachers.* USA: Woodbine House.

Sinambela, P.N.J.M. (2013). Pembelajaran di Perguruan Tinggi Bermuatan Karakter dan Berpikir Tingkat Tinggi Berorientasi Pada Problem Based Learning dengan Setting Web Based Learning [Learning in Characteristic University and High Order Thinking Skills on Problem Based Learning Orientation with Setting Web Based Learning. *Journal of Campus Generation*, 8(1). 15-23.

Slavin, R. E. (2011). Cooperative learning. *Learning and cognition in education*, 160-166.

Slavin, R. E. (2011). INSTRUCTION BASED ON COOPERATIVE LEARNING. *Handbook of Research on Learning and Instruction*, 344.

Soekamto, T., & Winataputra, U. S. (1997). *Teori belajar dan model-model pembelajaran* [Learning Theory and Model of Learning]. Jakarta: P2T Universitas Terbuka.

Squire, J. R. (1983). Composing and comprehending: Two sides of the same basic process. *Language Arts*, *60*(5), 581-589.

Suminar, S. O., & Meilani, R. I. (2016). Pengaruh model pembelajaran discovery learning dan problem based learning terhadap prestasi belajar peserta didik [The Effect of Discovery Learning and Problem Based Learning on Students' Achievement]. *Journal of Office Management Education, 1*(1), 80-89.

Suprapto, N. (2016). What should educational reform in Indonesia look like ? Learning from the PISA science scores of East-Asian countries and Singapore. *Asia-Pacific Forum on Science Learning and Teaching*, *17*(1), 1–21.

Suprihatiningrum, J. (2013). *Strategi pembelajaran teori dan aplikasi* [Teaching and Learning Strategy and its Application]. Jogjakarta: Ar-Ruzz Media.

Surayya, L., Subagia, I. W., & Tika, I. N. (2014). Pengaruh model pembelajaran think pair share terhadap hasil belajar IPA ditinjau dari keterampilan berpikir kritis siswa [The Effect of Think Pair Share on Science Achievement from Students' Critical Thinking Skills]. *Journal of Indonesian Science Education and Learning*, *4*(1), 1-10.

Sutiyatno, S. (2018). The effect of teacher's verbal communication and non-verbal communication on students' English achievement. *Journal of Language Teaching and Research*, *9*(2), 430-437.

Syah, M. (2010). *Psikologi pendidikan* [Educational Psychology]. Bandung: Remaja Rosdakarya.

Syah, M., Wardan, A. S., Rakhmat, M. F., & Muchlis. (1997). *Psikologi pendidikan: dengan pendekatan baru* [Psychology of Education: New Approach]. Bandung: Remaja Rosdakarya.

Tuovinen, J. E., & Sweller, J. (1999). A comparison of cognitive load associated with discovery learning and worked examples. *Journal of educational psychology*, *91*(2), 334.

Voogt, J., & Roblin, N. P. (2012). A comparative analysis of international frameworks for 21st century competences: Implications for national curriculum policies. *Journal of curriculum studies*, *44*(3), 299-321.

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.

Wajdi, M. B. N., Kuswandi, I., Al Faruq, U., Zulhijra, Z., Khairudin, K., & Khoiriyah, K. (2020). Education Policy Overcome Coronavirus, A Study of Indonesians. *EDUTEC: Journal of Education And Technology*, *3*(2), 96-106.

Watson, G. (1980). *Watson-Glaser critical thinking appraisal*. San Antonio, TX: Psychological Corporation.

Wood, J. T. (2011). *Communication in our lives*. United States: Cengage Learning.

World Health Organization. (2020). *Laboratory testing of 2019 novel coronavirus (2019- nCoV) in suspected human cases: interim guidance.* Geneva: World Health Organization.

Worth, S., Gross, L., & Gross, L. P. (1981). *Studying visual communication*. Philadelphia: University of Pennsylvania Press.

Zahara, A., Feranie, S., Winarno, N., & Siswantoro, N. (2020) Discovery Learning with the Solar System Scope Application to Enhance Learning in Middle School Students. *Journal of Science Learning*, *3*(3), 174-184.

Zaharah, Z., & Kirilova, G. I. (2020). Impact of Corona Virus Outbreak Towards Teaching and Learning Activities in Indonesia. *SALAM: Journal Social and Syar'i Culture*, *7*(3).

Zamroni & Mahfudz. (2009). *Panduan Teknis Pembelajaran yang Mengembangkan Critical Thinking* [Technical Learning Support on Developing Critical Thinking Skills]. Jakarta: Depdiknas.

Zivkovic, S. (2016). *A model of critical thinking as an important attribute for success in the 21st century*, *Procedia–Social and Behavioral Sciences (Elsevier)*, *232*, 102-108.