LEVERAGING STUDENTS' RETENTION AND CREATIVITY THROUGH SCIENCE-CONTENT MUSIC IN LEARNING SOLAR SYSTEM

RESEARCH PAPER

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

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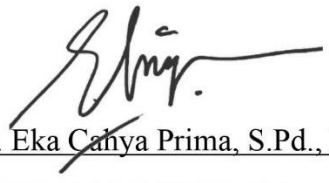

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ABSTRACT

The purpose of this research was to investigate the improvement of student's retention and creativity in learning solar system through science-content music as teaching media. As many researchers only focused on students' concept mastery problem, while less teacher and student aware about the importance of the ability of students to retain, such so-called declarative knowledge which does not only facilitates the understanding of new and related learning materials, it also helps to enhance students ' ability to analyze the nature of science issues. Also, creativity is one of the skills include on 4.0 century skill which needs to be improved. Recognizing the power of music nowadays, the author tries to dig up information about how the improvement of students' retention and creativity through this innovative teaching media, which is science-content music in learning one of science topics, solar system. In the direction of investigating the result, the method used in this research is pre-experimental with one group pre-test and post-test design. The population was 7th grade students of junior high school academic year 2019/2020 from private school 'X' and the sample taken was 50 students using convenience sampling. The instrument used consist of 30 multiple choices of objective test and CPAM rubric. According to the result, the application of science-content music has a significant improvement in students' retention in medium category (N-Gain=0.36) and good result of students' creativity (76%). As a conclude, science-content music can be considered as an alternative teaching media in learning Solar System that can be implemented in Junior Secondary Schools.

Key words: Students' Retention, Students' Creativity, Science-content music, Teaching Media

MENINGKATKAN RETENSI DAN KREATIFITAS SISWA MELALUI '*SCIENCE-CONTENT MUSIC*' DALAM PEMBELAJARAN TATA SURYA

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ABSTRAK

Tujuan penelitian ini adalah untuk mengetahui peningkatan retensi dan kreativitas siswa dalam pembelajaran tata surya melalui media pembelajaran *science-content music*. Karena banyak peneliti hanya memfokuskan pada masalah penguasaan konsep siswa, sedangkan guru dan siswa kurang menyadari pentingnya kemampuan retensi siswa untuk mempertahankan pengetahuan deklaratif yang tidak hanya memfasilitasi pemahaman materi pembelajaran baru dan terkait, tetapi juga juga membantu meningkatkan kemampuan siswa untuk menganalisis masalah dalam sains. Selain itu, kreativitas merupakan salah satu keterampilan yang termasuk dalam keterampilan abad 4.0 yang perlu ditingkatkan. Menyadari kekuatan musik saat ini, penulis mencoba menggali informasi tentang bagaimana peningkatan daya ingat dan kreativitas siswa melalui media pembelajaran yang inovatif yaitu *science-content music* dalam pembelajaran salah satu topik sains, tata surya. Untuk mengetahui hasil penelitian, metode yang digunakan dalam penelitian ini adalah pra-eksperimental dengan rancangan one group pre-test dan post-test. Populasi dalam penelitian ini adalah siswa kelas VII SMP tahun pelajaran 2019/2020 sekolah swasta 'X' dan sampel yang diambil adalah 50 siswa dengan menggunakan *convenience sampling*. Instrumen yang digunakan terdiri dari 30 pilihan ganda tes objektif dan rubrik CPAM. Berdasarkan hasil penelitian, penerapan *science-content music* mengalami peningkatan yang signifikan pada kategori sedang terhadap retensi siswa (N-Gain = 0,36) dan hasil kreativitas siswa yang baik (76%). Kesimpulannya, *science-content music* dapat dijadikan sebagai media pembelajaran alternatif dalam pembelajaran Tata Surya yang dapat diterapkan di Sekolah Menengah Pertama.

Key words: Retensi Siswa, Kreativitas Siswa, Science-content music, Media Pembelajaran

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REFERENCES

Adinna, E. (2016). *Understanding the eclipse*. Retrivied from https://www.researchgate.net/publication/310698854_UNDERSTANDING_THE_ECLIPSE

Aesthetics, A. H., & London, M. (2008). *Reviewed by Brian Kane*. *85*(85), 137–145. https://doi.org/10.7916/D8513WTK

Akhtar, A. (2008). Use of Media for Effective Instruction its Importance : Some Consideration. *Journal of Elementary Education: A Publication of Dept. of Elementary Education university of the Punjab, Lahore – Pakistan* Vol. 18 (1-2) 35-40. Retrivied from http://pu.edu.pk/images/journal/JEE/PDF-Files/JEE-18(1-2)%20No_3.pdf

Amin, H. U., & Malik, A. S. (2014). Memory retention and recall process. *EEG/ERP Analysis: Methods and Applications*, 219–237. https://doi.org/10.1201/b17605-11

Anderson, L. W., Krathwohl, D. R., & Bloom, B. S. (2001). *A taxonomy for learning, teaching, and assessing: a revision of Bloom's taxonomy of educational objectives*. *41*(4), 352. Retrieved from http://books.google.com/books?id=JPkXAQAAMAAJ&pgis=1

Aydin, S. (2017). 7th Class Students' Opinions on Sun, Earth and Moon System. *Universal Journal of Educational Research*, *5*(12B), 34–41. https://doi.org/10.13189/ujer.2017.051404

Barrouillet, P., Bernardin, S., Portrat, S., Vergauwe, E., & Camos, V. (2007). Time and Cognitive Load in Working Memory. *Journal of Experimental Psychology: Learning Memory and Cognition*, *33*(3), 570–585. https://doi.org/10.1037/0278-7393.33.3.570

Bennett, S. (2002). Musical Imagery Repetition. *Master Thesis*, pp. 1–63. Retrieved from http://zingle.org/Musical_Imagery_Repetition.doc

Binzel, R. P. (2002). An overview of the asteroids. *Asteroids III*, (January), 3–15. Retrieved from https://www.researchgate.net/publication/234841929_An_Overview_of_the_Asteroids_The_Asteroids_III_Perspective

Blair, R. (1952). Democracy, Art and Education. *Educational Forum*, *16*(4), 431–435. https://doi.org/10.1080/00131725209341529

Brooke, E. (2015). *Empowering Teacher Effectiveness: Five Key Factors for Success*. 1–7. Retrieved from https://www.lexialearning.com/sites/default/files/Teacher%20Effectiveness%20WP%202018.pdf

Broomhall, A. M., Chatterjee, P., Howe, R., Norton, A. A., & Thompson, M. J. (2014). The Sun's Interior Structure and Dynamics, and the Solar Cycle. *Space Science Reviews*, *186*(1–4), 191–225. https://doi.org/10.1007/s11214-014-0101-3

Cepeda, N. J., Vul, E., Rohrer, D., Wixted, J. T., & Pashler, H. (2008). Spacing effects in learning: A temporal ridgeline of optimal retention: Research article. *Psychological Science*, *19*(11), 1095–1102. https://doi.org/10.1111/j.1467-9280.2008.02209.x

César, M. B. (2014). Relationships between Earth's Rotation or Revolution and Geographical Extent of the Global Surface Monsoons. *Atmospheric and Climate Sciences*, *04*(01), 47–52. https://doi.org/10.4236/acs.2014.41006

Cochran, A. L., Levasseur-Regourd, A. C., Cordiner, M., Hadamcik, E., Lasue, J., Gicquel, A., … Kuan, Y. J. (2015). The Composition of Comets. *Space Science Reviews*, *197*(1–4), 9–46. https://doi.org/10.1007/s11214-015-0183-6

Cowan, N. (2008). What are the differences between long-term, short-term, and working memory? In *Progress in Brain Research* (Vol. 169). https://doi.org/10.1016/S0079-6123(07)00020-9

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, *11*(6), 671–684. https://doi.org/10.1016/S0022-5371(72)80001-X

Craik, F. I. M., Luo, L., & Sakuta, Y. (2010). Effects of Aging and Divided Attention on Memory for Items and Their Contexts. *Psychology and Aging*, *25*(4), 968–979. https://doi.org/10.1037/a0020276

Crowther, G. (2012). Using science songs to enhance learning: An interdisciplinary approach. *CBE Life Sciences Education*, *11*(1), 26–30. https://doi.org/10.1187/cbe.11-08-0068

Crowther, G. J., McFadden, T., Fleming, J. S., & Davis, K. (2016). Leveraging the power of music to improve science education. *International Journal of Science Education*, *38*(1), 73–95. https://doi.org/10.1080/09500693.2015.1126001

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

De Jong, T., & Ferguson-Hessler, M. G. M. (1996). Types and qualities of knowledge. *Educational Psychologist*, Vol. 31, pp. 105–113. https://doi.org/10.1207/s15326985ep3102_2

Džanić, N. D., & Pejić, A. (2016). The Effect of Using Songs On Young Learners and Their Motivation for Learning English. *NETSOL: New Trends in Social and Liberal Sciences*, *1*(2), 40–54. https://doi.org/10.24819/netsol2016.8

Ehlers, J., Hepp, K., Board, E., Beig, R., Domcke, W., Frisch, U., … Jaffe, R. L. (2008). Preface - Small Bodies in Planetary Systems. In *Lecture Notes in Physics* (Vol. 758). https://doi.org/10.1007/978-3-540-76935-4

ELIZABETH, O. O. (2008). *The Effects of Time Span on Memory Retention among Secondary School Students*. OBAFEMI AWOLOWO UNIVERSITY. Retrieved from https://www.scribd.com/document/393996985/The-Effects-of-Time-Span-on-Memory-Retention

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (1993). A Guided Tour of How to Design and Evalaute Research In Education. *How to Design and Evalaute Research In Education*, 1–29. Retrieved from https://saochhengpheng.files.wordpress.com/

Furqani, D., Feranie, S., & Winarno, N. (2018). The Effect of Predict-Observe-Explain (POE) Strategy on Students' Conceptual Mastery and Critical Thinking in Learning Vibration and Wave. *Journal of Science Learning*, *2*(1), 1. https://doi.org/10.17509/jsl.v2i1.12879

Ghofur, A. (2018). the Use of Media for Science Teaching in Islamic Schools. *Jurnal Pendidikan Edutama*, *5*(1), 1. https://doi.org/10.30734/jpe.v5i1.106

Governor, D., Hall, J., & Jackson, D. (2013). Teaching and Learning Science Through Song: Exploring the experiences of students and teachers. *International Journal of Science Education*, *35*(18), 3117–3140. https://doi.org/10.1080/09500693.2012.690542

Henke, A., & Höttecke, D. (2015). Physics Teachers' Challenges in Using History and Philosophy of Science in Teaching. *Science and Education*, *24*(4), 349–385. https://doi.org/10.1007/s11191-014-9737-3

Hyman, Ira & Rubin, D. (1990). *Memorabeatlia : A naturalistic study of long-term memory*. *18*(2), 205–214. https://doi.org/10.3758/BF03197096

Iranfar, S. (2015). *Scientific exploration on the earth's rotation influenced by torque force*. Retrieved from http://www.hoajonline.com/journals/pdf/97-1-1.pdf

Jensen, E. (2000). Moving with the Brain. *Educational Leadership*, Vol. 58, pp. 34–38. Retrieved from https://www.researchgate.net/publication/290965088_Moving_with_the_brain_in_mind

Joëlle Le Marec, F. R. (2019). Music knowledge and science studies. *How*

Languages Are Learned, *12*(1), 27–40. Retrieved from https://www.cairn.info/revue-informations-sociales-2005-3-page-48.htm

Johnson-Laird, P. N. (1998). Imagery, Visualization, and Thinking. *Perception and Cognition at Century's End*, 441–467. https://doi.org/10.1016/b978-012301160-2/50016-2

Kaplan, R. M., & Saccuzzo, D. P. (2009). *Psychological Testing Principles, Applications, and Issues* (Seventh ed; J. Perkins, Ed.). Wadsworth Cengage Learning. Retrieved from https://dl.uswr.ac.ir/bitstream/Hannan/130420/1/Robert_M._Kaplan__Dennis_P._Saccuzzo_Psychological_Testing_Principles__Applications__and_Issues____2008.pdf

Kapoor, H., & Prayogshala, M. (2014). *Applying Psychology to study Creativity*. https://doi.org/10.13140/2.1.4117.0888

Kuo, F., & Hwang, G. (2015). *International Forum of Educational Technology & Society A Five-Phase Learning Cycle Approach to Improving the Web-based Problem- Solving Performance of Students*. *17*(1). Retrieved from https://api.semanticscholar.org/CorpusID:41075423

Lineweaver, C., & Robles, J. (2006). Towards a Classification System of Terrestrial Planets. *6th Australian Space Science Conference*, 100–108. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Towards+a+Classification+System+of+Terrestrial+Planets#0%5Cnhttps://mplanet.anu.edu.au/~josan/filesfordown/LineweaverRobles2006.pdf

Marsden, E., & Torgerson, C. J. (2012). Single group, pre-post test research designs: Some methodological concerns. *Oxford Review of Education*, (May 2016). https://doi.org/10.2307/41702779

Martin, S. J., Grimwood, P. D., & Morris, R. G. M. (2000). Synaptic plasticity and memory: An evaluation of the hypothesis. *Annual Review of Neuroscience*, *23*(May 2014), 649–711. https://doi.org/10.1146/annurev.neuro.23.1.649

Matthews, J. A. (2014). Satellite Orbits. *Encyclopedia of Environmental Change*, (September 2007). https://doi.org/10.4135/9781446247501.n3400

Mayer, R. E., & Moreno, R. (1999). Cognitive principles of multimedialearning: the role of modality and contiguity. *Journal of Educational Psychology*, *91*(2), 358–368. https://doi.org/10.1037/0022-0663.91.2.358

Mazza, S., Gerbier, E., Gustin, M. P., Kasikci, Z., Koenig, O., Toppino, T. C., & Magnin, M. (2016). Relearn Faster and Retain Longer: Along With Practice, Sleep Makes Perfect. *Psychological Science*, *27*(10), 1321–1330. https://doi.org/10.1177/0956797616659930

McLeod, J. (2011). Educating for Creativity. In *Journal of Educational Administration and History* (Vol. 44). Retrieved from http://eric.ed.gov/?id=EJ980563

Meiers, M. (2007). Handbook of Teacher Education. In *Handbook of Teacher Education*. https://doi.org/10.1007/1-4020-4773-8

Miller, A. (2017). the Effects of Music on Memory. *Memory*, *50*(1), 1–5. Retrieved from http://clearinghouse.missouriwestern.edu/manuscripts/230.php

Mishra, S. (2017). Effective Integration of Ict and Innovative Techniques Towards Total Quality Assurance in School Education. *Scholarly Research Journal for Interdisciplinary Studies*, *49366*(4). Retrieved from https://www.srjis.com/pages/pdfFiles/1519467926110.%20Dr.%20Smita%20Mishra.pdf

Na, S. (2014). Erratum to Tidal evolution of lunar orbit and earth rotation (Journal of The Korean Astronomical Society). *Journal of the Korean Astronomical Society*, *47*(1), 41. https://doi.org/10.5303/JKAS.2014.47.1.41

Pasachoff, J. M., & Filippenko, A. (2019). The Jovian Planets. *The Cosmos*, 167–196. https://doi.org/10.1017/cbo9781139169332.008

Pfalzner, S., Davies, M. B., Gounelle, M., Johansen, A., Münker, C., Lacerda, P., … Veras, D. (2015). The formation of the solar system. *Physica Scripta*, *90*(6). https://doi.org/10.1088/0031-8949/90/6/068001

Pol, H. J., Harskamp, E. G., Suhre, C. J. M., & Goedhart, M. J. (2008). The effect of hints and model answers in a student-controlled problem-solving program for secondary physics education. *Journal of Science Education and Technology*, *17*(4), 410–425. https://doi.org/10.1007/s10956-008-9110-x

Robinette, M. (2002). *10-Easy-Steps-to-Teaching-The-Solar-System* (J. Soll, Karen & Boudart, Ed.). Vernon Hills, IL (U.S.A.): Learning Resources, Inc., Vernon Hills, IL (U.S.A.). Retrieved from https://www.learningresources.com/media/pdf/lr/resources/10-Easy-Steps-to-Teaching-The-Solar-System.pdf

Rodrigo, Dinuth. (2019). Nature of Processing and memory retention. Retrieved from https://www.researchgate.net/publication/335893556_Nature_of_Processing_and_memory_retention

Roediger, H. L., & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. *Trends in Cognitive Sciences*, *15*(1), 20–27. https://doi.org/10.1016/j.tics.2010.09.003

Russell, D. G. (2014). *Geophysical Classification of Planets, Dwarf Planets, and*

Moons: A Mass Scale and Composition Codes. (2012), 1–28. Retrieved from https://arxiv.org/pdf/1308.0616.pdf

Salkind, N. J. (2012). *Exploring Resrearch*. Retrieved from http://dinus.ac.id/repository/docs/ajar/Neil_J._Salkind_2012_-_Exploring_Research_.pdf

Sarmaa, R., & Baruahb, K. (2006). Iau Planet Definition: Some Confusion and Their Modifications. *Arxiv.Org*, (August), 1–8. Retrieved from http://arxiv.org/pdf/0810.0993

Serdyukov, P. (2017). Innovation in education: what works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*, *10*(1), 4–33. https://doi.org/10.1108/jrit-10-2016-0007

Steckler, M. A. (1998). The effects of music on healing. *The Journal of Long Term Home Health Care : The PRIDE Institute Journal*, *17*(1), 42–48. Retrieved from https://psycnet.apa.org/record/1998-01461-001

Sukasni, A., & Efendy, H. (2017). The Problematic of Education System in Indonesia and Reform Agenda. *International Journal of Education*, *9*(3), 183. https://doi.org/10.5296/ije.v9i3.11705

Sukmahidayanti, T. (2015). THE UTILIZATION OF INSTRUCTIONAL MEDIA IN TEACHING ENGLISH TO YOUNG LEARNERS (A Case Study of an Elementary School Teacher in Bandung). *Journal of English and Education*, *2015*(2), 90–100. Retrieved from https://ejournal.upi.edu/index.php/L-E/article/view/4758

Tan, A. (2017). A Mathematical Treatment of Solar Eclipse Formation. *International Journal of Mathematical Education.* Retrieved from https://www.researchgate.net/publication/303771209_A_Mathematical_Treatment_of_Solar_Eclipse_Formation

Telles, S., Reddy, S. K., & Nagendra, H. R. (2019). Ilmu Pengetahuan Alam Semester 2. In *Journal of Chemical Information and Modeling* (Vol. 53). https://doi.org/10.1017/CBO9781107415324.004

Tesoriero, M., & Rickard, N. S. (2012). Music-enhanced recall: An effect of mood congruence, emotion arousal or emotion function? *Musicae Scientiae*, *16*(3), 340–356. https://doi.org/10.1177/1029864912459046

Treffinger, Donald J. & Besemer, S. P. (1981). Analysis of Creative Products: Review and Synthesis. *The Journal of Creative Behavior*, *15*(3), 158–178. https://doi.org/10.1002/j.2162-6057.1981.tb00287.x

Utomo, S. W., Ubaidillah, M., Joyoatmojo, S., Yutmini, S., & Suryani, N. (2019). Improving Students' Creativity in Video Making by Problem Based Learning

Model. *International Journal of Educational Research Review*, 481–488. https://doi.org/10.24331/ijere.573956

Yalcin, F. A., Yalcin, M., & Isleyen, T. (2012). Pre-Service Primary Science Teachers' Understandings of the Moon's Phases and Lunar Eclipse. *Procedia - Social and Behavioral Sciences*, *55*, 825–834. https://doi.org/10.1016/j.sbspro.2012.09.569

Yang, G. (2009). Direct Optimization of Low-thrust Many-revolution Earth-orbit Transfers. *Chinese Journal of Aeronautics*, *22*(4), 426–433. https://doi.org/10.1016/S1000-9361(08)60121-1

Yoon, J., & Kim, K. J. (2017). Science Song Project: Integration of Science, Technology and Music to Learn Science and Process Skills. *K-12 STEM Education*, *3*(3), 235–250. https://doi.org/10.14456/k12stemed.2017.9

Zharkova, V. V., Shepherd, S. J., Zharkov, S. I., & Popova, E. (2019). Oscillations of the baseline of solar magnetic field and solar irradiance on a millennial timescale. *Scientific Reports*, *9*(1), 1–12. https://doi.org/10.1038/s41598-019-45584-3