

**PENGEMBANGAN PEMBELAJARAN PRAKTIKUM ANATOMI
TUMBUHAN MENGGUNAKAN MIKROSKOP *VIEWER ONLINE*
UNTUK MENINGKATKAN KECERDASAN MAJEMUK MAHASISWA**

DISERTASI

Diajukan untuk Memenuhi Sebagian dari Syarat untuk Memperoleh Gelar Doktor
Kependidikan dalam Bidang Pendidikan Ilmu Pengetahuan Alam



Oleh:

Sugianto

1605267

**PROGRAM STUDI
PENDIDIKAN ILMU PENGETAHUAN ALAM
SEKOLAH PASCASARJANA
UNIVERSITAS PENDIDIKAN INDONESIA
2021**

**PENGEMBANGAN PEMBELAJARAN PRAKTIKUM ANATOMI
TUMBUHAN MENGGUNAKAN MIKROSKOP *VIEWER ONLINE*
UNTUK MENINGKATKAN KECERDASAN MAJEMUK MAHASISWA**

Oleh
Sugianto

. S.Pd.I IAIN Syekh Nurjati Cirebon, 2009
M.Pd Universitas Negeri Semarang, 2013

Sebuah Disertasi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Doktor Pendidikan (Dr.) pada Program Studi Pendidikan Ilmu Pengetahuan Alam

© Sugianto 2021
Universitas Pendidikan Indonesia
Januari 2021

Hak Cipta dilindungi undang-undang.
Disertasi ini tidak boleh diperbanyak seluruhnya atau sebagian,
dengan dicetak ulang, difoto kopi, atau cara lainnya tanpa ijin dari penulis.

LEMBAR PENGESAHAN

SUGIANTO

**PENGEMBANGAN PEMBELAJARAN PRAKTIKUM ANATOMI
TUMBUHAN MENGGUNAKAN MIKROSKOP *VIEWER ONLINE*
UNTUK MENINGKATKAN KECERDASAN MAJEMUK MAHASISWA**

Disetujui dan disahkan untuk mengikuti Ujian Tahap II

Promotor



Dr. Any Fitriani, M.Si
NIP. 196502021991032001

Ko-Promotor



Dr. Sri Anggraeni, M.Si
NIP. 19580126 198703 2 001

Anggota



Prof. Dr. Wawan Setiawan, M.Kom
NIP. 196601011991031005

Mengetahui

Ketua Program Studi Pendidikan Ilmu Pengetahuan Alam



Dr. Ida Kaniawati, M.Si
NIP. 196807031992032001

ABSTRAK

PENGEMBANGAN PEMBELAJARAN PRAKTIKUM ANATOMI TUMBUHAN MENGGUNAKAN MIKROSKOP *VIEWER ONLINE* UNTUK MENINGKATKAN KECERDASAN MAJEMUK MAHASISWA

Berdasarkan hasil studi lapangan pada pembelajaran praktikum anatomi tumbuhan ditemukan masih rendahnya kecerdasan majemuk mahasiswa yang terdiri atas kecerdasan jasmaniah kinestetik, visual spasial, logis matematis, naturalis, bahasa, interpersonal dan intrapersonal. Penelitian ini bertujuan untuk mengembangkan pembelajaran praktikum anatomi tumbuhan berbantuan mikroskop *viewer online* untuk meningkatkan kecerdasan majemuk mahasiswa. Jenis penelitian yang digunakan yaitu R&D (*Research and Development*), dengan prosedur penelitian terdiri atas studi pendahuluan, perencanaan, pengembangan produk awal, uji coba lapangan awal, revisi produk, uji coba lapangan utama, revisi produk siap oprasioanl, uji lapangan oprasional, revisi final, desiminasi dan implementasi. Penelitian ini dilakukan pada mahasiswa pendidikan biologi di dua Perguruan Tinggi wilayah tiga Cirebon. Hasil penelitian menunjukkan: 1) Rancangan pembelajaran praktikum anatomi tumbuhan menggunakan mikroskop *viewer online* disusun berdasarkan tahapan pembelajaran praktikum anatomi tumbuhan, prosedur *online*, *tool* aplikasi mikroskop *viewer online*, dan tipe kecerdasan majemuk. 2) Rancangan mikroskop *viewer online* dalam pembelajaran praktikum anatomi tumbuhan untuk meningkatkan kecerdasan majemuk mahasiwa memiliki beberapa bagian aplikasi diantaranya: Laman *LKS*, Navigasi *Aktivitas Optilab*, Navigasi *Image Rester*, Laman *Hasil Pengamatan dan Pembahasan*, Navigasi *Laporan Praktikum*, Navigasi *Komentar dan Chat*. 3) Kecerdasan majemuk mahasiswa hasil pembelajaran praktikum anatomi tumbuhan menggunakan mikroskop *viewer online*, menunjukkan interpretasi aktivitas kecerdasan majemuk yang sangat tinggi dengan skor rata-rata 82,23%, dan memiliki interpretasi yang tinggi dalam meningkatkan kecerdasan majemuk mahasiswa dengan rata-rata N-Gain Skor 0,81. 4) Respon mahasiswa terhadap pembelajaran praktikum anatomi tumbuhan menggunakan mikroskop *viewer online*, berdasarkan respon penerapan pembelajarannya memiliki interpretasi yang tinggi dengan skor 7,84 %, dan berdasarkan tanggapan pengguna mikroskop *viewer online* menunjukkan interpretasi yang sangat tinggi dengan skor 87,03%. 5) Hasil uji hipotesis menunjukkan nilai Sig. 0,00 < 0,05, dan t-hitung 28,454 > t-tabel 2,376, artinya terdapat perbedaan kecerdasan majemuk mahasiswa antara kelas yang menggunakan mikroskop *viewer online* dan kelas yang tidak menggunakannya pada pembelajaran praktikum anatomi tumbuhan.

Kata Kunci: Pembelajaran praktikum anatomi tumbuhan, Mikroskop *viewer online*, Kecerdasan majemuk

ABSTRACT

DEVELOPMENT OF PLANT ANATOMY EXERCISE LABORATORY LEARNING USING ONLINE VIEWER MICROSCOPE TO IMPROVE STUDENT'S MULTIPLE INTELLIGENCE

Based on the results of field studies on plant anatomy exercise laboratory learning, it was found that students' multiple intelligences were still low consisting of kinesthetic physical intelligence, visual spatial, logical mathematical, naturalist, language, interpersonal and intrapersonal. This study aims to develop plant anatomy exercise laboratory learning assisted by an online viewer microscope to improve students' multiple intelligences. The type of research used is R & D (Research and Development), with research procedures consisting of preliminary studies, planning, initial product development, initial field trials, product revisions, main field trials, product revision ready for operation, operational field testing, final revision, dissemination and implementation. This research was conducted on biology education students at two tertiary educational institutions in Cirebon. The results showed: 1) The composition of plant anatomy exercise laboratory learning using an online viewer microscope was prepared based on the practical learning stages of plant anatomy, online procedures, online viewer microscope application tools, and multiple intelligence types. 2) The design of the online viewer microscope in learning plant anatomy exercise laboratory to increase students' multiple intelligences has several application parts including: LKS pages, optical activity navigation, image recenter navigation, observation and discussion results pages, exercise laboratory report navigation, comment navigation and chat. 3) The multiple intelligence of students learning from plant anatomy exercise laboratory learning using an online viewer microscope, shows a very high interpretation of multiple intelligence activities with an average score of 82.23%, and has a high interpretation in increasing the multiple intelligence of students with an average N-Gain Score 0.81. 4) Student responses to plant anatomy exercise laboratory learning using an online viewer microscope seen based on the response to the application of learning have a high interpretation with a score of 7.84%, and viewed based on the responses of users of the online viewer microscope shows a very high interpretation with a score of 87.03%. 5) Hypothesis test results show the value of Sig. 0.00 <0.05, and t-count 28.454 > t-table 2.376, which means that there is a difference in students' multiple intelligences between the class using the online viewer microscope and the class that doesn't use it in plant anatomy exercise laboratory.

Keywords: Plant anatomy exercise laboratory learning, Online viewer microscope, Multiple intelligence

DAFTAR ISI

HALAMAN JUDUL	i
HAK CIPTA	ii
LEMBAR PENGESAHAN	iii
ABSTRAK	iv
DAFTAR ISI.....	vi
DAFTAR PUSTAK.....	viii
BAB I PENDAHULUAN	1
1.1 Latar Belakang	1
1.2 Rumusan Masalah	6
1.3 Batasan Masalah	6
1.4 Tujuan Penelitian	7
1.5 Manfaat Penelitian	7
1.6 Definisi Oprasional	8
BAB II KECERDASAN MAJEMUK MAHASISWA DAN KAITANNYA DENGAN PEMBELAJARAN PRAKTIKUM ANATOMI TUMBUHAN MENGUNAKAN MIKROSKOP VIEWER ONLINE	12
2.1 Mikroskop <i>Viewer Online</i> dan Kontribusinya terhadap Kecerdasan Majemuk.....	12
2.1.1 Mikroskop viewer online	12
2.1.2 Kontribusi mikroskop <i>viewer online</i> terhadap kecerdasan majemuk	22
2.2 Pembelajaran praktikum anatomi tumbuhan menggunakan Mikroskop <i>Viewer Online</i>	27
2.3 Karakteristik Kecerdasan Majemuk melalui Mikroskop <i>Viewer Online</i>	65
2.4 Hipotesis.....	80
BAB III METODE PENELITIAN.....	81
3.1 Jenis Penelitian.....	81
3.2 Lokasi dan Waktu Penelitian	81
3.3 Subjek Penelitian	81
3.4 Prosedur Penelitian	81
3.4.1 Studi Pendahuluan	83
3.4.2 Perencanaan	85
3.4.3 Pengembangan Produk Awal	86
3.4.4 Uji Coba Lapangan Awal	100
3.4.5 Revisi Produk Utama	100
3.4.6 Uji Coba Lapangan Utama.....	101
3.4.7 Revisi Produk Oprasional	102
3.4.8 Uji Coba Lapangan Oprasional	102
3.4.9 Produk Final	102
3.4.10 Desiminasi.....	102
3.5 Teknik pengumpulan data.....	103
3.6 Teknik Analisis Data	104
3.6.1 Analisis uji coba tes	104

3.6.2 Analisis kondisi awal dan kebutuhan mahasiswa pada praktikum anatomi tumbuhan	109
3.6.3 Analisis data hasil observasi aktivitas kecerdasan majemuk mahasiswa...110	
3.6.4 Analisis data hasil tes kecerdasan majemuk mahasiswa.....110	
3.6.5 Analisis data hipotesis.....112	
3.6.6 Analisis data respon mahasiswa terhadap pembelajaran praktikum anatomi tumbuhan menggunakan mikroskop <i>viewer online</i>	114
3.6.7 Analisis data respon mahasiswa terhadap aplikasi mikroskop <i>viewer online</i>	114
3.7 Jenis, metode dan instrument pengumpulan data, serta teknik analisis data .115	
BAB IV HASIL PENELITIAN DAN PEMBAHASAN	116
4.1 Hasil Penelitian	116
4.1.1 Rancangan Pembelajaran Praktikum Anatomi Tumbuhan Menggunakan Mikroskop <i>Viewer Online</i> untuk Meningkatkan Kecerdasan Majemuk Mahasiswa	116
4.1.2 Rancangan Mikroskop <i>Viewer Online</i> dalam Pembelajaran Praktikum Anatomi Tumbuhan untuk Meningkatkan Kecerdasan Majemuk Mahasiswa	119
4.1.3 Kecerdasan Majemuk Mahasiswa Hasil Pembelajaran Praktikum Anatomi Tumbuhan Menggunakan Mikroskop <i>Viewer Online</i>	132
4.1.4 Respon Mahasiswa terhadap Pembelajaran praktikum anatomi tumbuhan Menggunakan Mikroskop <i>Viewer Online</i>	147
4.1.5 Hasil Uji Hipotesis	151
4.2 Pembahasan.....	155
4.2.1 Rancangan Pembelajaran Praktikum Anatomi Tumbuhan Menggunakan Mikroskop <i>Viewer Online</i> untuk Meningkatkan Kecerdasan Majemuk Mahasiswa	155
4.2.2 Rancangan Mikroskop <i>Viewer Online</i> dalam Pembelajaran Praktikum Anatomi Tumbuhan untuk Meningkatkan Kecerdasan Majemuk Mahasiwa	159
4.2.3 Kecerdasan Majemuk Mahasiswa Hasil Pembelajaran Praktikum Anatomi Tumbuhan Menggunakan Mikroskop <i>Viewer Online</i>	163
4.2.4 Respon Mahasiswa terhadap Pembelajaran praktikum anatomi tumbuhan Menggunakan Mikroskop <i>Viewer Online</i>	89
4.2.5 Hasil hipotesis	194
BAB V KESIMPULAN DAN SARAN	197
5.1 Kesimpulan	197
5.2 Keterbatasan Produk	198
5.4 Implikasi	198
5.5 Saran	199
LAMPIRAN-LAMPIRAN.....	208

DAFTAR PUSTAKA

- Achdiyat, M., & Utomo, R. (2018). Kecerdasan Visual-Spasial, Kemampuan Numerik, dan Prestasi Belajar Matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, 7(3), 234–245. <https://doi.org/10.30998/formatif.v7i3.2234>
- Akkoyunlu, B. & Soylu, M. Y. (2006). *A Study on Students' Views About Blended learning Environment*. Hacettepe Universit: Ankara: Department of Computer Education and Instructional Technology, Faculty of Education
- Alexandrova, E. M., Astafieva, O. A., Alexandrovna, T., Koloskova, & Kolycheva, G. Y. (2019). Supplemental Blended Learning for Undergraduate Students. *The European Proceedings of Social & Behavioural Sciences*, 12(68). <https://doi.org/https://doi.org/10.15405/epsbs.2019.12.68>
- Alotaibi, O., & ALQahtani, D. (2016). Measuring dental students' preference: A comparison of light microscopy and virtual microscopy as teaching tools in oral histology and pathology. *Saudi Dental Journal*, 28(4), 169–173. <https://doi.org/10.1016/j.sdentj.2015.11.002>
- Alqahtani, A. (2019). Usability testing of google cloud applications: Students' perspective. *Journal of Technology and Science Education*, 9(3), 326–339. <https://doi.org/10.3926/JOTSE.585>
- Arikunto, S. (2006). *Prosedur Penelitian : Suatu Pendekatan Praktik, Edisi Revisi VI*. Jakarta: PT Rineka Cipta.
- Armstrong, T. (2009). *Multiple intelligences in the classroom*. New York: Penguin Group.
- Azran, M., Salleh, M., Mahfuzah, M., & Nurul, S. (2017). The Effectiveness of using Multiple Intelligences Courseware in Learning Multimedia Subject. *Advanced Journal of Technical and Vocational Education 1*, 1(3), 11–16.
- Azwar. (2011). *Pengantar Psikologi Intelligensi*. Yogyakarta : Pustaka Pelajar Goleman Daniel. Jakarta: Gramedia.
- Barclay, G. F. (2015). Anatomy and Morphology of Seed Plants. In *eLS*. Chichester: John Wiley & Sons. <https://doi.org/10.1002/9780470015902.a0002068.pub2>
- Bespalova, & Kuznetzova. (2018). Interactive Practice-Oriented Techniques in Professional Media Education. *Media Education*, 58(4), 11–22. <https://doi.org/10.13187/me.2018.4.11>
- Bharatkumar, K. (2015). The Role of Multiple Intelligence in E-Learning. *International Journal for Scientific Research & Development*, 3(5), 2321–0613.
- Borg & Gall. (1983). *Educational Research: An Introduction, Fifth Edition*. New

York: Longman.

- Borg & Gall. (2003). *Educational Research* (Seventh Ed). New York: Longman.
- Bouker, J., & Scarlatos, A. (2013). Investigating the impact on fluid intelligence by playing N-Back games with a kinesthetic modality. *International Conference and Expo on Emerging Technologies for a Smarter World, CEWIT 2013*. <https://doi.org/10.1109/CEWIT.2013.6713747>
- Brown, P. J., Fews, D., & Bell, N. J. (2016). Teaching veterinary histopathology: A comparison of microscopy and digital slides. *Journal of Veterinary Medical Education*, 43(1), 13–20. <https://doi.org/10.3138/jvme.0315-035R1>
- Buerger, S., & Foord, L. (2020). Using Digital Microscopes in an Online Lab. *American Biology Teacher*, 82(3), 178–180. <https://doi.org/10.1525/abt.2020.82.3.178>
- Cakrawati, L. M. (2017). Students' Perceptions on the Use of Online Learning Platforms in Efl Classroom. *English Language Teaching and Technology Journal (ELT-Tech Journal)*, 1(1), 22–30.
- Campbell, N. A. (2009). *Biology* (9th Editio). USA: Benjamin Cummings.
- Crang, R., Lyon, S., & Wise, R. (2019). *Plant Anatomy*. USA: Springer.
- Dalyono, M. (2007). *Psikologi Pendidikan; Cet ke-1*. Jakarta: Rineka Cipta.
- De la Cruz Ordoñez, A., & Cruzata Martínez, A. (2017). Inteligencia emocional y kinestésica en la educación física de la educación primaria. *Actualidades Investigativas En Educación*, 17(2), 1–21. <https://doi.org/10.15517/aie.v17i2.28681>
- Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, 49(1), 5–22. <https://doi.org/10.1177/0047239520934018>
- Djamarah, S. B., & Zain, S. (2010). *Strategi Belajar Mengajar*. Jakarta: Rineka Cipta.
- Evert, R. F. (2006). *Esau's Plant Anatomy: Meristems, Cells, and Tissues of the Plant Body: Their Structure, Function, and Development*. Madison: University of Wisconsin.
- Fahn, A. (1991). *Anatomi tumbuhan edisi ketiga*. Yogyakarta: UGM Press.
- Febaliza, A., & Okatariyani, O. (2020). The Development of Online Learning Media by Using Moodle for General Chemistry Subject. *Journal of Educational Science and Technology (EST)*, 6(1), 40–47. <https://doi.org/10.26858/est.v6i1.12339>
- Febrianto, P. T., Mas'udah, S., & Megasari, L. A. (2020). Implementation of online learning during the covid-19 pandemic on Madura Island, Indonesia. *International Journal of Learning, Teaching and Educational Research*,

- 19(8), 233–251. <https://doi.org/10.26803/ijlter.19.8.13>
- Fry, S. C. (2016). Cells. In *Encyclopedia of Applied Plant Sciences*. Elsevier Ltd. <https://doi.org/10.1016/B978-0-12-394807-6.00119-2>
- Gardner, H. (1993). *Multiple Intelligences: The Theory in Practice A Reader*. Basic Books.
- Gatumu, M. K., MacMillan, F. M., Langton, P. D., Headley, P. M., & Harris, J. R. (2014). Evaluation of usage of virtual microscopy for the study of histology in the medical, dental, and veterinary undergraduate programs of a UK University. *Anatomical Sciences Education*, 7, 389–398. <https://doi.org/10.1002/ase.1425>
- Goode, L. and, & Mullins, V. (2009). *Digital Microscopes in Elementary Classrooms*. Rice University. https://cnx.org/contents/hHlf03_B@4/Digital-Microscopes-in-Elementary-Classrooms
- Hajhashemi, K., Caltabiano, N., Anderson, N., & Tabibzadeh, S. (2018). Multiple intelligences, motivations and learning experience regarding video-assisted subjects in a rural university. *International Journal of Instruction*, 11(1), 168–182. <https://doi.org/10.12973/iji.2018.11112a>
- Hamid, R., Sentryo, I., & Hasan, S. (2020). Online learning and its problems in the Covid-19 emergency period. *Jurnal Prima Edukasia*, 8(1), 86–95. <https://doi.org/https://doi.org/10.21831/jpe.v8i1.32165>
- Hamilton, P. W., Wang, Y., & McCullough, S. J. (2015). Virtual microscopy and digital pathology in training and education. *APMIS*, 120(4), 305–315. <https://doi.org/10.1111/j.1600-0463.2011.02869.x>
- Herayanti, L., Fuaddunnazmi, M., & Habibi, H. (2017). Pengembangan Media Pembelajaran Berbasis Moodle pada Mata Kuliah Fisika Dasar. *Jurnal Pendidikan Fisika Dan Teknologi*, 1(2), 210–219. <https://doi.org/10.29303/jpft.v1i3.260>
- Herodotou, C., Muirhead, D., Aristeidou, M., Hole, M., Kelley, S., Scanlon, E., & Duffy, M. (2020). Blended and online learning: a comparative study of virtual microscopy in Higher Education. *Interactive Learning Environments*, 28(6). <https://doi.org/10.1080/10494820.2018.1552874>
- Hoerr, T. (2000). *Becoming a multiple intelligences school*. Virginia USA: Association for Supervision and Curriculum Development.
- Hofstein, A., & Naaman, R. M. (2007). The laboratory in science education: The state of the art. *Chemistry Education Research and Practice*, 8(2), 105–107. <https://doi.org/10.1039/B7RP90003A>
- Hossain, Z., Bumbacher, E., Brauneis, A., Diaz, M., Saltarelli, A., Blikstein, P., & Riedel-Kruse, I. H. (2018). Design Guidelines and Empirical Case Study for Scaling Authentic Inquiry-based Science Learning via Open Online Courses and Interactive Biology Cloud Labs. *International Journal of Artificial*

- Intelligence in Education*, 28, 478–507. <https://doi.org/10.1007/s40593-017-0150-3>
- Husairi, A., & Sibuea, A. M. (2015). Penggunaan Media Pembelajaran dan Kecerdasan Ganda Terhadap Hasil Belajar. *JURNAL TEKNOLOGI INFORMASI & KOMUNIKASI DALAM PENDIDIKAN*, 1(1), 1–9. <https://doi.org/10.24114/jtikp.v1i1.1864>
- Hutabarat, P. M. (2020). Pengembangan Podcast sebagai Media Suplemen Pembelajaran Berbasis Digital pada Perguruan Tinggi. *Jurnal Sosial Humaniora Terapan*, 2(2), 107–116. <https://doi.org/10.7454/jsht.v2i2.85>
- Isirep, S. (1993). *Struktur dan perkembangan tumbuhan*. Yogyakarta: UGM Press.
- Jones, P. (2008). *The Teacher's SMART Guide To Choosing and Using Digital Microscopes*. Australia: The Logical Interface.
- Kaewkiriya, T., Utakrit, N., & Tiantong, M. (2016). The Design of a Rule Base for an e-Learning Recommendation System Base on Multiple Intelligences. *International Journal of Information and Education Technology*, 6(3), 206–210. <https://doi.org/10.7763/ijiet.2016.v6.685>
- Kaewkiriya, Thongchai. (2016). Design Of A Mobile E-Learning Forecasting System Based On A Case Study Using Multiple Intelligence Analysis. *International Journal of Electronic Commerce Studies*, 7(2), 189–200. <https://doi.org/10.7903/ijecs.1413>
- Kaur, M. (2017). Effect Of Web Based Instruction On Achievement In Biology In Relation To Multiple Intelligences. *International Journal of Education & Applied Sciences Research*, 4(1), 1–9. <https://doi.org/10.5281/zenodo.243576>
- Kim, H., Gerber, L. C., Chiu, D., Lee, S. A., Cira, N. J., Xia, S. Y., & Riedel-Kruse, I. H. (2016). LudusScope: Accessible interactive smartphone microscopy for life-science education. *PLoS ONE*, 11(10), 1–16. <https://doi.org/10.1371/journal.pone.0162602>
- Kimball, J. W. (1992). *Biologi jilid 2*. Jakarta: Erlangga.
- Klassen, R., & Durksen, T. (2014). Weekly self-efficacy and work stress during the teaching practicum: A mixed methods study. *Learning and Instruction*, 33(2014), 158–169. <https://doi.org/10.1016/j.learninstruc.2014.05.003>
- Kombe, J. (2014). *Genetika dan Pengaruh Lingkungan pada Kecerdasan*. Munich: GRIN Verlag.
- Kuhlthau, C. (2006). *Guided Inquiry Learning in the 21st Century*. CT: Libraries Westport: CT: Libraries Unlimited.
- Kuo, K. H., & Leo, J. M. (2018). Optical Versus Digital Microscope for Medical Education: A Systematic Review. *Anatomical Sciences Education*. <https://doi.org/10.1002/ase.1844>

- Lachman, S. J. (1997). Learning is a process: Toward an improved definition of learning. *Journal of Psychology: Interdisciplinary and Applied*, 131(5), 477–480. <https://doi.org/10.1080/00223989709603535>
- Lee, L., Goldman, H., & Hortsch, M. (2018). The virtual microscopy database—sharing digital microscope images for research and education. *Anatomical Sciences Education*, 11, 510–512. <https://doi.org/10.1002/ase.1774>
- Loveless, A. . (1987). *Prinsip-prinsip biologi tumbuhan untuk daerah tropic jilid II*. Jakarta: Gramedia Utama.
- Manggopa, H. K., Manoppo, C. T. M., Mewengkang, P. V. T. A., & Batmetan, J. R. (2019). Web-Based Learning Media Using Hypertext Markup Language as Course Materials. *Jurnal Pendidikan Teknologi Dan Kejuruan*, 25(1), 116–123. <https://doi.org/10.21831/jptk.v25i1.23469>
- Martínez, A., Isabel, M., Sánchez, A., Luis, J., Morales, M. M., & Llopis González, A. (2016). *Results of the implementation of a virtual microscope in a course of histology*. 169–176. <https://doi.org/10.4995/head16.2016.2626>
- McCoog, I. J. (2014). Integrated Instruction: Multiple Intelligences and Technology. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas*, 81(1), 25–28. <https://doi.org/10.3200/tchs.81.1.25-28>
- Mccutcheon, K., Lohan, M., Traynor, M., & Martin, D. (2015). A systematic review evaluating the impact of online or blended learning vs. face-to-face learning of clinical skills in undergraduate nurse education. *Journal of Advanced Nursing*, 71(2), 255–269. <https://doi.org/10.1111/jan.12509>
- McLaughlin, J. E., Griffin, L. M., & Esserman, D. A. (2014). Pharmacy student engagement, performance, and perception in a flipped satellite classroom. *American Journal of Pharmaceutical Education*, 77(9), 1–8.
- Meltzer. (2002). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif dan R&D)*. Bandung: Alfabeta.
- Microscopeworld. (2020). *How to Calculate Microscope on-screen Magnification*. Microscope World. <https://www.microscopeworld.com/p-3375>
- Mison, M. M., Shaffiei, Z. A., Mutalib, A. A., & Suhadak, S. A. (2014). Teaching the Indigenous Students with Courseware Based on Theory of Multiple Intelligences. *American Journal of Economics and Business Administration*, 3(3), 525–533. <https://doi.org/10.3844/ajebasp>
- Munif Chatib. (2010). *Munif Chatib, Sekolahnya Manusia, Sekolah Berbasis Multiple Intelligence di Indonesia; cet ke-1*. Bandung: Kaifa.
- Novitasari, D. (2016). Pengaruh Penggunaan Interaktif Terhadap Kemampuan Konsep Matematis. *FIBONACCI: Jurnal Pendidikan Matematika Dan Matematika*, 2(2), 8–18. <https://doi.org/10.24853/fbc.2.2.8-18>

- Pandey. (1980). *An Introduction to Plant Anatomy*. New Delhi: S. Chand.
- Perveen, A. (2018). Facilitating multiple intelligences through multimodal learning analytics. *Turkish Online Journal of Distance Education*, 19(1), 1302–6488. <https://doi.org/10.17718/tojde.382655>
- Phillips, A., Pane, J. F., Reumann-Moore, R., & Shenbanjo, O. (2020). Implementing an adaptive intelligent tutoring system as an instructional supplement. *Educational Technology Research and Development*. <https://doi.org/10.1007/s11423-020-09745-w>
- Prasetyo, A., & Novita, M. (2018). Training Multiple Intelligences (Visual-spatial and Linguistic Intelligence) of Students Through Guided Inquiry Model Lesson on Reaction Rate Chapter. *SNK 2018*. <https://doi.org/10.2991/snk-18.2018.45>
- Purnama, R., Sesunan, F., & Ertikanto, C. (2017). Pengembangan Media Pembelajaran Mobile Learning Berbasis Android Sebagai Suplemen Pembelajaran Fisika SMA Pada Materi Usaha Dan Energi. *Jurnal Pembelajaran Fisika Universitas Lampung*, 5(4), 64–74.
- Rahmawati, K. (2016). Faktor-Faktor yang Mempengaruhi Kecerdasan Linguistik. *Jurnal Pendidikan Guru Sekolah Dasar*, 3(5), 227–236.
- Rensburg, J. van, & Sophia, E. (2018). Effective online teaching and learning practices for undergraduate health sciences students: An integrative review. *International Journal of Africa Nursing Sciences*, 9(2018), 73–80. <https://doi.org/10.1016/j.ijans.2018.08.004>
- Riduwan. (2012). *Skala Pengukuran Variabel- variabel Penelitian*. Bandung: Alfabeta.
- Riedl, J. A., Stouten, K., Ceelie, H., Boonstra, J., Levin, M. D., & van Gelder, W. (2015). Interlaboratory Reproducibility of Blood Morphology Using the Digital Microscope. *Journal of Laboratory Automation*, 20(6), 670–675. <https://doi.org/10.1177/2211068215584278>
- Risnawati, Amir, Z., & Sari, N. (2018). The development of learning media based on visual, auditory, and kinesthetic (VAK) approach to facilitate students' mathematical understanding ability. *Journal of Physics: Conference Series*, 1028(1), 1–8. <https://doi.org/10.1088/1742-6596/1028/1/012129>
- Rizqi, A. A., Suyitno, H., & Sudarmin. (2016). Analisis Kemampuan Komunikasi Matematis Ditinjau dari Kepercayaan Diri Siswa Melalui Blended Learning. *Unnes Journal of Mathematics Education Research*, 5(1), 17–23.
- Roddy, C., Amiet, D. L., Chung, J., Holt, C., Shaw, L., McKenzie, S., Garivaldis, F., Lodge, J., & Mundy, M. E. (2017). Applying Best Practice Online Learning, Teaching, and Support to Intensive Online Environments: An Integrative Review. *Frontiers in Education*, 2(2017), 2–10. <https://doi.org/10.3389/educ.2017.00059>

- Ruscic, M., Vidovic, A., & Kovace, G. (2018). The use of microscope in school biology teaching. *Resolution and Discovery*, 3(1), 13–16. <https://doi.org/https://doi.org/10.1556/2051.2018.00054>
- Santoso, S. (2014). *Panduan Lengkap SPSS Versi 20 Edisi Revisi*. Jakarta: Elex Media Komputindo.
- Sari, A. P., & Setiawan, A. (2018). The Development of Internet-Based Economic Learning Media using Moodle Approach. *International Journal of Active Learning*, 3(2), 100–109.
- Sasidharakurup, H., Radhamani, R., Kumar, D., Nizar, N., Achuthan, K., & Diwakar, S. (2015). Using Virtual Laboratories as Interactive Textbooks: Studies on Blended Learning in Biotechnology Classrooms. *EAI Endorsed Transactions on E-Learning*, 2(6), 1–13. <https://doi.org/10.4108/el.2.6.e4>
- Schmidt, C., Reinehr, M., Leucht, O., Behrendt, N., Geiler, S., & Britsch, S. (2014). MyMiCROscope-Intelligent virtual microscopy in a blended learning model at Ulm University. *Annals of Anatomy*, 193(5), 395–402. <https://doi.org/10.1016/j.aanat.2011.04.009>
- Sengupta, A. (2017). Internet-based approach to multiple intelligences: Multiple provisions for multiple learners. *Journal of Technology for ELT*, 7(2).
- Sherman, C. (2014). Technology Skill Development Among Education Majors. *The Journal of Technology Studies*, 40(1). <https://doi.org/10.21061/jots.v40i1.a.1>
- Sugiyono. (2011). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: Alfabeta.
- Sumriddetchkajorn, S., Somboonkaew, A., & Chanhorm, S. (2012). Mobile device-based digital microscopy for education, healthcare, and agriculture. *International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology, ECTI-CON 2012*. <https://doi.org/10.1109/ECTICon.2012.6254186>
- Sun. (2020). *Manfaat online Learning*. SUN Education. <https://suneducationgroup.com/>
- Sun, A., & Chen, X. (2016). Online education and its effective practice: A research review. *Journal of Information Technology Education: Research*, 15(2016), 157–190. <https://doi.org/10.28945/3502>
- Suparno, P. (2004). *Teori Intelligence Ganda dan Aplikasinya di Sekolah, Cara Menerapkan Teori Multiple Intelligencess Howard Gardner*. Yogyakarta: Kanisius.
- Susilowati, D., & Wicaksono, A. (2019). Pengembangan Media E-Learning Dengan Schoology Sebagai Suplemen Pembelajaran Materi Fluida Statis. *Jurnal Pendidikan Teknologi Informasi Dan Vokasional*, 1(1), 8–16. <https://doi.org/http://dx.doi.org/10.23960/jpvti.v1.i1.201905>

- Tampubolon. (2014). *Penelitian Tindakan Kelas Sebagai Pengembangan Profesi Pendidik dan Keilmuan*. Jakarta: Erlangga.
- Tejaningrum, D. (2014). Pengembangan Alat Permainan My Costume untuk Menstimulasi Kecerdasan Visual-Spasial pada Anak Usia Dini Autis. *INKLUSI*, 1(2). <https://doi.org/10.14421/ijds.010201>
- Tian, Y., Xiao, W., Li, C., Liu, Y., Qin, M., Wu, Y., Xiao, L., & Li, H. (2014). Virtual microscopy system at Chinese medical university: An assisted teaching platform for promoting active learning and problem-solving skills. *BMC Medical Education*, 74(14), 1–8. <https://doi.org/10.1186/1472-6920-14-74>
- Triola, M. M., & Holloway, W. J. (2014). Enhanced virtual microscopy for collaborative education. *BMC Medical Education*, 11(4), 1–7. <https://doi.org/10.1186/1472-6920-11-4>
- Tripathi, R. K., Kurle, D. G., Jalgaonkar, S. V., Sarkate, P. V., & Rege, N. N. (2017). Implementation of supplemental E-learning models for online learning in pharmacology. *National Journal of Physiology, Pharmacy and Pharmacology*, 7(10), 1084–1090. <https://doi.org/10.5455/njppp.2017.7.0514527052017>
- Xhomara, N., & Shkemi, F. (2020). Journal of Applied Technical and Educational Sciences jATES The influence of multiple intelligences on learning styles in teaching and learning. *Journal of Applied Technical and Educational Sciences*, 10(1), 19–48. <https://doi.org/10.24368/jates.v10i1.148>
- Yuan, R., & Lee, I. (2014). Pre-service teachers' changing beliefs in the teaching practicum: Three cases in an EFL context. *System*, 44, 1–12. <https://doi.org/10.1016/j.system.2014.02.002>
- Zainuddin, M. (1997). *Mengajar di Perguruan Tinggi Bagian Keempat*. Jakarta: Departemen Pendidikan dan Kebudayaan.