

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA
TUNANETRA UNTUK PENGEMBANGAN ORIENTASI MOBILITAS
DENGAN PENDEKATAN MODEL *FIELD TRIP***

SKRIPSI

diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar
Sarjana Pendidikan Program Studi Pendidikan Ilmu Komputer



oleh

Az Pranata

1407276

**PROGRAM STUDI PENDIDIKAN ILMU KOMPUTER
DEPARTEMEN PENDIDIKAN ILMU KOMPUTER
FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM
UNIVERSITAS PENDIDIKAN INDONESIA
2020**

Az Pranata, 2020

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA TUNANETRA UNTUK PENGEMBANGAN
ORIENTASI MOBILITAS DENGAN PENDEKATAN *FIELD TRIP***

Universitas Pendidikan Indonesia | respository.upi.edu | perpustakaan.upi.edu

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA
TUNANETRA UNTUK PENGEMBANGAN ORIENTASI MOBILITAS
DENGAN PENDEKATAN MODEL *FIELD TRIP***

Oleh:

Az Pranata

1407276

Sebuah Skripsi yang Diajukan untuk Memenuhi Salah Satu Syarat Memperoleh
Gelar Sarjana Pendidikan pada Fakultas Pendidikan Matematika dan Ilmu
Pengetahuan Alam

©Az Pranata

Universitas Pendidikan Ilmu Komputer

2020

Hak cipta dilindungi Undang-Undang

Skripsi ini tidak boleh diperbanyak seluruhnya atau sebagian
dengan dicetak ulang atau, difotokopi atau cara lainnya tanpa izin dari penulis

Az Pranata, 2020

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA TUNANETRA UNTUK PENGEMBANGAN
ORIENTASI MOBILITAS DENGAN PENDEKATAN *FIELD TRIP***

Universtitas Pendidikan Indonesia | respository.upi.edu | perpustakaan.upi.edu

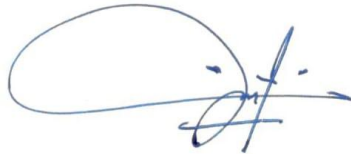
LEMBAR PENGESAHAN

AZ PRANATA

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA
TUNANETRA UNTUK PENGEMBANGAN ORIENTASI MOBILITAS
DENGAN PENDEKATAN MODEL *FIELD TRIP***

disetujui dan disahkan oleh:

Pembimbing I



Lala Septem Riza, M.T., Ph.D.

NIP. 197809262008121001

Pembimbing II

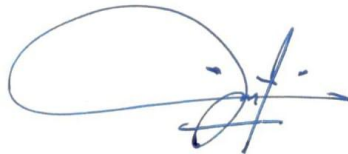


Rizky Rachman Judhie, M.Kom.

NIP. 197711252006041002

Mengetahui

Ketua Departemen Pendidikan Ilmu Komputer



Lala Septem Riza, M.T., Ph.D.

NIP. 197809262008121001

**PEMBANGUNAN MULTIMEDIA PEMBELAJARAN BAGI SISWA
TUNANETRA UNTUK PENGEMBANGAN ORIENTASI MOBILITAS
DENGAN PENDEKATAN MODEL *FIELD TRIP***

Oleh

Az Pranata - azpranata@student.upi.edu

1407276

ABSTRAK

Penelitian ini dilatarbelakangi oleh dampak ketunetraan yang menyebabkan anak tunanetra mengalami keterbatasan dalam interaksi dengan lingkungan, melakukan orientasi mobilitas, dan belajar pada bahan ajar yang bersifat visual. Tujuan dari penelitian ini adalah untuk merancang, mengimplementasikan, dan menganalisis respon siswa tunanetra terhadap konsep multimedia pembelajaran yang digunakan untuk pengembangan orientasi mobilitas dengan mempertimbangkan aspek multimedia anak tunanetra, prinsip orientasi, komponen orientasi, model pembelajaran *field trip*, dan *game*. Pembangunan multimedia pembelajaran dalam penelitian ini dilakukan dengan menggunakan metode *waterfall*. Eksperimen dilakukan kepada 3 orang siswa SLB Negeri A Kota Bandung. Hasil dari eksperimen kemudian diolah dan dianalisis berdasarkan metode kualitatif. Temuan penelitian menunjukkan bahwa penggunaan multimedia pembelajaran, tanggapan siswa, dan memperoleh nilai setelah menggunakan multimedia pembelajaran sangatlah baik. Multimedia pembelajaran yang dibangun dapat digunakan, diterima, dianggap menyenangkan, dan memberikan dampak positif untuk siswa tunanetra.

Kata Kunci : Multimedia pembelajaran, siswa tunanetra, model *field trip*

**DEVELOPMENT OF LEARNING MULTIMEDIA FOR BLIND
STUDENTS FOR MOBILITY ORIENTATION DEVELOPMENT WITH
FIELD TRIP MODEL APPROACH**

By

Az Pranata - azpranata@student.upi.edu

1407276

ABSTRACT

This research is motivated by the impact of blindness which causes blind children to experience limitations in interacting with the environment, conducting mobility orientation, and learning on visual teaching material. The purpose of this study is to design, implement, and analyze the responses of students with visual impairments to the concept of multimedia learning that is used for the mobility orientation development by considering the multimedia aspects of blind children, orientation principles, orientation components, learning models field trip, and games. Development of learning multimedia in this study was carried out using the method waterfall. The experiment was carried out on 3 students of SLB Negeri A Kota Bandung. The results of the experiments are then processed and analyzed based on qualitative methods. The research findings show that the use of learning multimedia, student responses, and obtaining grades after using learning multimedia is very good. Learning multimedia that is built can be used, accepted, considered enjoyable, and has a positive impact on blind students.

Keywords: *Learning multimedia, blind students, field trip model*

DAFTAR ISI

KATA PENGANTAR.....	Error! Bookmark not defined.
UCAPAN TERIMA KASIH.....	Error! Bookmark not defined.
ABSTRAK.....	3
DAFTAR ISI.....	5
DAFTAR TABEL.....	Error! Bookmark not defined.
DAFTAR GAMBAR.....	Error! Bookmark not defined.
DAFTAR LAMPIRAN.....	Error! Bookmark not defined.
BAB I PENDAHULUAN.....	Error! Bookmark not defined.
1.1 Latar Belakang Penelitian.....	Error! Bookmark not defined.
1.2 Rumusan Masalah Penelitian.....	Error! Bookmark not defined.
1.3 Batasan Masalah Penelitian.....	Error! Bookmark not defined.
1.4 Tujuan Penelitian.....	Error! Bookmark not defined.
1.5 Manfaat Penelitian.....	Error! Bookmark not defined.
1.6 Struktur Organisasi Skripsi.....	Error! Bookmark not defined.
BAB II KAJIAN TEORI.....	Error! Bookmark not defined.
2.1 Anak Berkebutuhan Khusus Tunanetra.....	Error! Bookmark not defined.
2.1.1 Pengertian Tunanetra.....	Error! Bookmark not defined.
2.1.2 Klasifikasi Tunanetra.....	Error! Bookmark not defined.
2.1.3 Karakteristik Anak Tunanetra.....	Error! Bookmark not defined.
2.1.4 Prinsip Pembelajaran Bagi Siswa Tunanetra.....	Error! Bookmark not defined.
2.1.5 Kebutuhan Pembelajaran atau Latihan Bagi Anak Tunanetra.....	Error! Bookmark not defined.
2.2 Pengembangan OMSK untuk Siswa Tunanetra.....	Error! Bookmark not defined.
2.3 Orientasi Mobilitas.....	Error! Bookmark not defined.

2.2.1 Pengertian Orientasi Mobilitas.....	Error! Bookmark not defined.
2.2.2 Prinsip Orientasi.....	Error! Bookmark not defined.
2.2.3 Komponen Orientasi.....	Error! Bookmark not defined.
2.4 Media Pembelajaran.....	Error! Bookmark not defined.
2.3.1 Pengertian Media Pembelajaran.....	Error! Bookmark not defined.
2.3.2 Pengertian Multimedia.....	Error! Bookmark not defined.
2.3.3 Aspek Penilaian Multimedia Pembelajaran.....	Error! Bookmark not defined.
2.3.4 Media Pembelajaran Untuk Anak Berkebutuhan Khusus Tunanetra.....	Error! Bookmark not defined.
2.5 <i>Game</i>	Error! Bookmark not defined.
2.4.1 Pengertian <i>Game</i>	Error! Bookmark not defined.
2.4.2 Kriteria Perancangan <i>Game</i>	Error! Bookmark not defined.
2.6 Model Pembelajaran.....	Error! Bookmark not defined.
2.5.1 Model Pembelajaran <i>Field Trip</i>	Error! Bookmark not defined.
2.5.2 Langkah-langkah Model Pembelajaran <i>Field Trip</i>	Error! Bookmark not defined.
2.5.3 Kelebihan dan Kekurangan.....	Error! Bookmark not defined.
BAB III METODE PENELITIAN.....	Error! Bookmark not defined.
3.1 Desain Penelitian.....	Error! Bookmark not defined.
3.2 Partisipan dan Tempat Penelitian.....	Error! Bookmark not defined.
3.2.1 Populasi Penelitian.....	Error! Bookmark not defined.
3.2.2 Sampel Penelitian.....	Error! Bookmark not defined.
3.3 Pengumpulan Data.....	Error! Bookmark not defined.
3.4 Analisis Data.....	Error! Bookmark not defined.
3.5 Pemeriksaan Keabsahan Data.....	Error! Bookmark not defined.
BAB IV TEMUAN DAN PEMBAHASAN.....	Error! Bookmark not defined.

4.1 Rancangan Multimedia untuk Anak Tunanetra	Error! Bookmark not defined.
4.1.1 Multimedia Pembelajaran untuk Anak Tunanetra	Error! Bookmark not defined.
4.1.2 Prinsip Orientasi.....	Error! Bookmark not defined.
4.1.3 Komponen Orientasi.....	Error! Bookmark not defined.
4.1.4 Model Pembelajaran <i>Field Trip</i>	Error! Bookmark not defined.
4.1.5 RPP Skenario Multimedia.....	Error! Bookmark not defined.
4.1.6 Model <i>Game</i>	Error! Bookmark not defined.
4.2 Pembangunan Multimedia Pembelajaran untuk Anak Tunanetra	Error! Bookmark not defined.
4.2.1 Tahap Analisis.....	Error! Bookmark not defined.
4.2.2 Tahap Desain.....	Error! Bookmark not defined.
4.2.3 Tahap Implementasi Multimedia.....	Error! Bookmark not defined.
4.2.4 Tahap Pengujian.....	Error! Bookmark not defined.
4.3 Skenario Penelitian.....	Error! Bookmark not defined.
4.4 Temuan.....	Error! Bookmark not defined.
4.4.1 Penilaian Berdasarkan Aspek Multimedia	Error! Bookmark not defined.
4.4.2 Penilaian Berdasarkan Aspek Audio...	Error! Bookmark not defined.
4.4.3 Penilaian Berdasarkan Aspek Prinsip Orientasi	Error! Bookmark not defined.
4.4.4 Penilaian Berdasarkan Aspek Komponen Orientasi	Error! Bookmark not defined.
4.4.5 Penilaian Berdasarkan Karakteristik Anak Tunanetra	Error! Bookmark not defined.
4.4.6 Penilaian Berdasarkan Pengetahuan....	Error! Bookmark not defined.
4.5 Pembahasan Hasil Penelitian.....	Error! Bookmark not defined.
4.6 Komparasi dengan Penelitian Sebelumnya....	Error! Bookmark not defined.
BAB V SIMPULAN DAN REKOMENDASI.....	Error! Bookmark not defined.
5.1 Simpulan.....	Error! Bookmark not defined.
5.3 Saran.....	Error! Bookmark not defined.
DAFTAR PUSTAKA.....	5

DAFTAR PUSTAKA

- Archambault, D. & Burger, D. (2000). TIM (Tactile Interactive Multimedia): Development and Adaptation of Computer Games for Young Blind Children. *Jurnal: Workshop on Interactive Learning Environments for Children*
- Archambault, D. & Olivier, D. (2005). How to Make Games for Visually Impaired Children. *Proceedings of the 2005 ACM SIGCHI International Conference on Advances in computer entertainment technology*, 450-453. doi: <https://doi.org/10.1145/1178477.1178578>
- Archambault, D., Burger, D., & Sabl'e, S. (2001). The TIM Project: Tactile Interactive Multimedia Computer Games for Blind and Visually Impaired Children. *Jurnal: Proceedings of the AAATE*, 359-363
- Arrigo, M. (2005) E-Learning Accessibility for Blind Students. *Recent Research Developments in Learning Technologies*, 1-5
- Astari, D.Y. (2016). *Pengertian dan Klasifikasi Tunanetra*. [Online]. Diakses dari <https://www.scribd.com/document/326301281/Pengertian-Dan-Klasifikasi-Tunanetra>
- Badiah, L.I.B. (2016). Keefektifan Pembelajaran IPA dengan Menggunakan Modul Audio Interaktif Mengenal Bagian Akar dan Fungsinya untuk Siswa Tunanetra Kelas IV di SLB YPAB Surabaya, 1-10
- Buaud, A., Archambault, D., Roussel, B., & Truchot, T. (2003). Evaluation Process Based on User's Need : Ergonomic Evaluation of Multimedia Games for Visually Impaired Children. *Assistive Technology: Shaping the Future*
- Behrendt, M. & Franklin, T. (2014). A Review of Research on School Field Trips and Their Value in Education. *International Journal of Environmental & Science*, 9, 235-245. doi: <https://doi.org/10.12973/ijese.2014.213a>
- Bhavani, N., Pater, T., Chaudhari, P., Patel, M., & Gaidhani, A. (2016). NewsReader Application for Blind People Using Text to speech Synthesis. *International Research Journal of Engineering and Technology (IRJET)*, 3, 744-746

- Bouroui, A. & Soufi, M. (2018). Br'Eye: An Android Mobile Application to Teach Arabic and French Braille Alphabets to Blind Children in Tunisia. *ICCHP 2018: Computers Helping People with Special Needs*, 357-364. doi: https://doi.org/10.1007/978-3-319-94277-3_56
- Buzzi, M., Leporini, B., & Senette, C. (2015). Playing with geometry: a Multimodal Android App for Blind Children. *Proceedings of the 11th Biannual Conference on Italian SIGCHI Chapter*, 134-137. doi: <https://doi.org/10.1145/2808435.2808458>
- Departemen Kesehatan. (2014). *Situasi Penyandang Disabilitas*. Jakarta: Depkes
- Departemen Pendidikan Nasional. (2003). *Undang-Undang Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional*. Jakarta: Depdiknas
- Departemen Pendidikan Nasional. (2005). *Peraturan Pemerintah Nomor 19 Tahun 2005 tentang Standar Pendidikan Nasional*. Jakarta: Depdiknas
- Dini, S., Ferlino, L., Gettani A., Martinoli, C. & Ott, M. (2007). Educational software and low vision students: evaluating accessibility factors. *Jurnal: Universal Access in the Information Society*, 15-29
- Erikson, Y. & Gargenfors, D. (2005). Computer Games for Children with Visual Impairments. *International Journal on Disability and Human Development*, 4, 161-167. doi: <https://doi.org/10.1515/IJDHD.2005.4.3.161>
- Hosni, I. (2012). *Konsep Dasar Orientasi dan Mobilitas*. [Online]. Diakses dari http://file.upi.edu/Direktori/FIP/JUR._PEND._LUAR_BIASA/195101211985031-IRHAM_HOSNI/KONSEP_DASAR_ORIENTASI_DAN_MOBILITAS.pdf
- Hosni, I. (t.t.). *Buku Ajar Orientasi dan Mobilitas*. Jakarta: Departemen Pendidikan dan Kebudayaan"
- Jafri, R. & Ali, S.A. (2015). Utilizing 3D Printing to Assist the Blind. *The 2015 International Conference on Health Informatics and Medical Systems(HIMS'15)*, 55-61
- Janier, J.B., Ahmad, W.F.W., & Firdaus, S.B. (2013). Representing Visual Content of Movie Cartoons through Narration for the Visually Impaired. *IEEE Conferences: International Conference on Computer Applications*

- Technology* (ICCAT), 1-3. doi:
<https://doi.org/10.1109/ICCAT.2013.6522042>
- Kementerian Kesehatan RI. (2013). *Riset Kesehatan Dasar*. [Online]. Diakses dari
<https://www.kemkes.go.id/resources/download/general/Hasil%20Risksdas%202013.pdf>
- Kementerian Kesehatan RI. (2014). *Penyandang Disabilitas Pada Anak*. [Online].
 Diakses dari https://www.kemkes.go.id/resources/download/pusdatin/infodatin/infodatin_disabilitas.pdf
- Kementerian Pendidikan dan Kebudayaan (2014). *Program Pengembangan Kekhususan (Pedoman Pengembangan Orientasi Mobilitas, Sosial, dan Komunikasi untuk Peserta Didik Tunanetra*. Jakarta: Kemeterian Pendidikan dan Kebudayaan
- Khan, M.M. & Bayoumi, S. (2015). Multimedia as a Help for Children with Special Learning Needs. *IEEE Conferences: International Conference on Cloud Computing (ICCC)*, 1-5. doi:
<https://doi.org/10.1109/CLOUDCOMP.2015.7149647>
- Kumar, M.V.N.R.P., Ghodake, A., S, P.S., A, M.V., & S, S.S. (2014). Design of Voice Touch Screen Display for Blind. *International Journal of Research in Advent Technology*, 2, 135-138
- Kustandi, C. & Sutjipto, B. (2013). *Media Pembelajaran: Manual dan Digital*. Bogor: Ghalia Indonesia.
- Lauer, C. (2009). Contending with Terms: “Multimodal” and “Multimedia” in the Academic and Public Spheres. *Computer and Composition*, 26, 225-239, doi: <https://doi.org/10.1016/j.compcom.2009.09.001>
- Lowenfeld, V. & Brittam, W.L. (1955). New York: The Macmillan Company
- Marpaung, I.Y.O. & Siagian, S. (2016). Pengembangan Media Pembelajaran Bahasa Indonesia Berbasis Macromedia Flass Proffesional 8 Kelas V SD Swasta Namira. *Jurnal Teknologi Informasi & Komunikasi dalam Pendidikan*, 3, 28-40
- Martono, K.T. (2015). Pengembangan Game dengan Menggunakan Game Engine Game Maker. *Jurnal Sistem Komputer*, 5, 23-30

- Mayer, R.E. (2002). Multimedia Learning. *The Annual Report of Educational Psychology in Japan*, 41, 27-29
- Mhaske, A.V., & Sadavarte, M.S. (2016). Portable Camera Based Assistive Text Reading from Hand Held Objects for Blind Person. *International Journal of Advanced Research in Computer and Communication Engineering*, 5, 625-628
- Michie, M. (1998). Factors influencing secondary science teachers to organise and conduct field trips. *Australian Science Teacher's Journal*, 44(4), 43-50.
- Mikulowski, D., Terlikowski, G., & Pawlowska, J.B. (2016). Virtual Cubarithms – Innovative Assistive Technology for Teaching the Blind and Visually Impaired Students Traditional Columnar Layout Operations. *Studia Informatica : systems and information technology*, 17-25
- Moleong, L. J. (2011). *Metodologi Penelitian Kualitatif. Edisi Revisi*. Bandung: PT Penerbit Remaja Rosdakarya.
- Muhammad, J.K.A. (2008). *Special Education for Special Children*. Bandung: PT. Mizan Publika
- Muniandy, M. & Sulaiman, S. (2017). Touch Sensation as part of Multimedia Design Elements to Improve Computer Accessibility for the Blind Users. *International Conference on Research and Innovation in Information Systems (ICRIIS)*. doi: <https://doi.org/10.1109/ICRIIS.2017.8002447>
- Munir. (2012). *Multimedia Konsep & Aplikasi dalam Pendidikan*. Bandung: Alfabeta
- Murray, I. & Armstrong, H. (2004). A Computing Education Vision for the Sight Impaired. *Proceedings of the Sixth Australasian Conference on Computing Education*, 30, 201-206
- Nabors, M.L., Edwards, L.C., & Murray, R.K. (2009). Making the case for field trips: What research tells us and what site coordinators have to say. *Education* 129(4), 661-667.
- Nesbit, J.B. & Li, J. (2004). Web-Based Tools for Learning Object Evaluation. *International conference on education*
- Nuryetty, M.T. (2011). *Kesulitan Fungsional Pendudukan Indonesia*. Jakarta: Badan Pusat Statistik.

- Paixao, R.S.S. & Pereira, C.P. (2018). Web Application for Model, Share and Conversion of Entity-relationship Diagrams for Person Visually Impaired. *Jurnal: International Conference on Computer Supported Education*, 405-411
- Peterson, R., Verenikina, I., & Herrington, J. (2008). Standars for Educational, Edutainment, and Delevomentally Beneficial Computer Games. *Proceedings of the World Conference on Educational Multimedia*
- Pramartha, I.N.B. (2015). Sejarah dan Sistem Pendidikan Sekolah Luar Biasa Bagian A Negeri Denpasar Bali. *Historia: Jurnal Pembelajaran Sejarah dan Sejarah*, 3, 67-74. doi: <http://dx.doi.org/10.24127/hj.v3i2.274>
- Rahardja, D. (2012). *Ketunanetraan*. [Online]. Diakses dari http://file.upi.edu/Direktori/FIP/JUR._PEND._LUAR_BIASA/195904141985031-DJADJA_RAHardJA/KETUNANETRAAN.pdf
- Ritzhaupt, A.D., Higgins, H.J., & Allred, S.B (2010). Teacher Experiences on the Integration of Modern Educational Games in the Middle School Mathematics Classroom. *Journal of Computers in Mathematics and Science Teaching*, 29, 189-216
- Sable, S., Archambault, D. (2003) Blindstation : a Game Platform Adapted to Visually Impaired Children. *Jurnal: Assistive Technology*, 232-236
- Salen, K. & Zimmerman, E. (2004). *Rules of Plays Game Design Fundamentals*. England: The MIT Press Cambridge, Massachusetts.
- Sanchez, J. & Baloian, N. (2003). AudioBattleship: Blind Learners Collaboration through Sound. *CHI '03 Extended Abstracts on Human Factors in Computing Systems*, 798-799. doi: <https://doi.org/10.1145/765891.765998>
- Sanchez, J. & Elias, M. (2006). Blind Children Learning Science through Audio-Base Interactive Software. 587-596
- Sanchez, J. & Rodriguez, S.P. (2010). Videogame for Improving Orientation and Mobility in Blind Student. *Paper presented at the 8th International Conference on Disability, Virtual Reality and Associated Technologies*, 229-302

- Sanchez, J. & Saenz, M. (2006). 3D Sound Interactive Environments for Blind Children Problem Solving Skills. *Behaviour & Information Technology*, 25, 237-378. doi: <https://doi.org/10.1080/01449290600636660>
- Shepherd, I. (2001). *Providing Learning Support for Blind and Visually Impaired Student Undertaking Fieldwork and Related Activities*. England: GDN
- Sjostrom, C. (2001). Using Haptics in Computer Interfaces for Blind People. *CHI '01 Extended Abstracts on Human Factors in Computing Systems*, 245-246. doi: <https://doi.org/10.1145/634067.634213>
- Somantri, T. S. (2006). *Psikologi Anak Luar Biasa*. Bandung: PT. Refika Aditama.
- Stephen M. Alessi, & Stanley R. Trollip. (2001). *Multimedia for Learning Methods and Development*. Massachusetts: Allyn & Bacon-A Pearson Education Company
- Sugiyono. (2010). *Memahami Penelitian Kualitatif*. Bandung: Alfabeta.
- Sugiyono. (2017). *Metode Penelitian Pendidikan*. Bandung: Alfabeta
- Sunanto, J. (2012). *Anak dengan Gangguan Penglihatan*. [Online]. Diakses dari http://file.upi.edu/Direktori/FIP/JUR._PEND._LUAR_BIASA/196105151987031-JUANG_SUNANTO/anak_dgn_gangguan_penglihatan.pdf
- Tal, T, & Morag, O. (2009). Reflective Practice as a Means for Preparing to Teach Outdoors in an Ecological Garden. *J Sci Teacher Educ*, 20:245–262. doi: <https://doi.org/10.1007/s10972-009-9131-1>
- Uysal, S.A. & Duger, T. (2012) Writing And Reading Training Effects On Font Typeand Size Preferences By Students With Low Vision. *Jurnal: Perceptual and Motor Skill*, 837-846
- Vaughan, T. (2011). *Multimedia: Making It Work (Eighth Edition)*. New York: McGraw-Hill
- Whitesell, E.R. (2016). A Day at theMuseum: The Impact of Field Trips on Middle School Science Achievement. *Journal Of Research In Science Teaching*. 1-19. doi: <https://doi.org/10.1002/tea.21322>
- World Health Organization. (2007). *Vision 2020 The Right to sight*. France: WHO Press