PENENTUAN PRIORITAS KRITERIA PENGGUNAAN MEDIA PEMBELAJARAN *ONLINE* PADA MASA *EMERGENCY REMOTE TEACHING* (ERT) MENGGUNAKAN METODE *ANALYTICAL HIERARCHY PROCESS* (AHP)

SKRIPSI

Diajukan untuk Memenuhi Sebagai Syarat Memperoleh Gelar Sarjana Pendidikan Teknik Elektro Konsentrasi Elektronika Industri

Oleh:

Hilman Permana

E.0451.1909306

PROGRAM STUDI S1 PENDIDIKAN TEKNIK ELEKTRO

FAKULTAS PENDIDIKAN TEKNOLOGI DAN KEJURUAN

UNIVERSITAS PENDIDIKAN INDONESIA

2023

PENENTUAN PRIORITAS KRITERIA PENGGUNAAN MEDIA PEMBELAJARAN *ONLINE* PADA MASA *EMERGENCY REMOTE TEACHING* (ERT) MENGGUNAKAN METODE *ANALYTICAL HIERARCHY PROCESS* (AHP)

Oleh
Hilman Permana

Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Pendidikan pada Program Studi S1 Pendidikan Teknik Elektro

© Hilman Permana
Universitas Pendidikan Indonesia
2023

Hak Cipta dilindungi Undang – Undang.
Skripsi ini tidak boleh diperbanyak seluruhnya atau sebagian,
dengan dicetak ulang, difotokopi, atau cara lain tanpa izin dari peneliti.

LEMBAR PENGESAHAN SKRIPSI

Hilman Permana

NIM 1909306

***PENENTUAN PRIORITAS KRITERIA PENGGUNAAN MEDIA PEMBELAJARAN ONLINE* PADA MASA *EMERGENCY REMOTE TEACHING* (ERT) MENGGUNAKAN METODE *ANALYTICAL HIERARCHY PROCESS* (AHP)**

Disetujui dan disahkan oleh pembimbing:

Pembimbing I

Prof. Dr. Ade Gaffar Abdullah. M. Si.

NIP. 19721113 199903 1 001

Pembimbing II

Dr. Erik Haritman. S.Pd.. M.T.

NIP. 19760527 200112 1 002

Mengetahui,

Ketua Program Studi

Pendidikan Teknik Elektro

Dr. Ir. Maman Somantri, S.Pd., M.T.

NIP. 19720119 200112 1 001

ABSTRAK

Banyak lembaga di Indonesia dengan cepat mengalihkan program pendidikan ke pembelajaran *online* dengan persiapan minimal dikarenakan pandemi COVID-19. Hal ini membuat keadaan yang disebut *Emergency Remote Teaching* (ERT) yang didefinisikan sebagai perubahan sementara secara mendadak dari pembelajaran interaksi secara luar jaringan (luring) ke dalam jaringan (daring) sebagai dampak yang disebabkan oleh bencana. Penting bagi tenaga pendidik untuk mengetahui hal utama pada penggunaan media pembelajaran *online.* Penelitian ini bertujuan mencari rekomendasi kriteria dan alternatif pada penggunaan media pembelajaran *online* dari sudut pandang tenaga pendidik dengan menggunakan metode *Analytical Hierarchy Process* (AHP) yang cocok untuk membuat peringkat masalah. Metode ini merupakan pengambilan keputusan kelompok yang menggunakan proses pemeringkatan secara luas dan dalam berbagai bidang. Instrumen penelitian berupa angket yang telah diisi oleh tenaga pendidik yaitu dosen dan guru dengan jumlah 13 responden. Penelitian ini menghasilkan bahwa kriteria dan alternatif pada posisi pertama untuk penggunaan media pembelajaran *online* yaitu kriteria kemudahan pengoperasian (K1) dan alternatif *fastness* (A1). Penelitian selanjutnya diharapkan dapat dieksplorasi untuk menerapkan metode AHP dalam aspek lain dalam pembelajaran *online*.

Kata Kunci: *Emergency Remote Teaching* (ERT), Media Pembelajaran *Online*, *Analytical Hierarchy Process* (AHP)

ABSTRACT

Many institutions in Indonesia swiftly shifted their educational programs to online learning with minimal preparation due to the COVID-19 pandemic. This has resulted in a situation termed as Emergency Remote Teaching (ERT), defined as a temporary and abrupt shift from offline (face-to-face) to online (virtual) instructional delivery as a consequence of a disaster. It is crucial for educators to grasp key aspects of utilizing online learning media. This research aims to identify recommended criteria and alternatives for the use of online learning media from the educators' perspective, employing the Analytical Hierarchy Process (AHP) method, which is suitable for ranking issues. This method involves a group decision-making process that employs comprehensive and multidimensional ranking in various domains. The research instrument comprises a questionnaire filled out by educators, including lecturers and teachers, totaling 13 respondents. The study reveals that the top-ranked criteria and alternative for the use of online learning media are the ease of operation criterion (K1) and the fastness alternative (A1). Future research is encouraged to further explore the application of the AHP method in other aspects of online learning.

Keywords: Emergency Remote Teaching (ERT), Online Learning Media, Analytical Hierarchy Process (AHP)

DAFTAR ISI

LEMBAR PENGESAHAN SKRIPSI .....
LEMBAR PERNYATAAN i
ABSTRAK ii
ABSTRACT iii
UCAPAN TERIMA KASIH iv
DAFTAR ISI vi
DAFTAR GAMBAR ix
DAFTAR TABEL x
DAFTAR LAMPIRAN xii
BAB I PENDAHULUAN 1
1.1 Latar Belakang 1
1.2 Rumusan Masalah 3
1.3 Batasan Masalah 3
1.4 Tujuan Penelitian 3
1.5 Manfaat Penelitian 4
1.6 Struktur Organisasi Skripsi 4
BAB II KAJIAN PUSTAKA 6
2.1 Media Pembelajaran 6
2.1.1 Macam-Macam Media Pembelajaran 6
2.1.1.1 Media Pembelajaran *Online* 7
2.1.1.2 Media Pembelajaran *Offline* 7
2.2 *Emergency Remote Teaching* (ERT) 8
2.3 Metode Kerangka Pengambilan Keputusan 8
2.3.1 *Analytical Hierarchy Process* (AHP) 9
2.3.2 *Simple Additive Weighting* (SAW) 10
2.3.3 *Technique for Order Preference by Similarity to Ideal Solution* (TOPSIS) 11
BAB III METODE PENELITIAN 12
3.1 Desain Penelitian 12
3.2 Partisipan 13
3.3 Instrumen Penelitian 13

3.4 Prosedur 14
3.5 Teknik Analisis Data 14
3.5.1 *Decomposition* (Dekomposisi) 14
3.5.2 *Comparative Judgement* (Perbandingan Berpasangan) 14
3.5.3 *Synthesis of Priority* (Sintesis Prioritas) 15
3.5.4 Nilai Maksimum *Eigen* (λmaks) 16
3.5.5 *Logical Consistency* (Konsistensi Logis) 16
3.5.6 Bobot Peringkat 17
BAB IV TEMUAN DAN PEMBAHASAN 18
4.1 Temuan Penelitian 18
4.1.1 Menentukan Kriteria dan Alternatif Penggunaan Media Pembelajaran *Online* 18
4.1.1.1 Hasil Kriteria Penggunaan Media Pembelajaran *Online* 21
4.1.1.1.1 Matriks Perbandingan Berpasangan Kriteria 21
4.1.1.1.2 Menentukan Nilai *Eigen* Ksriteria 23
4.1.1.1.3 Menentukan Nilai Maksimum *Eigen* (λmaks) 24
4.1.1.1.4 Menghitung Consistency Index (CI) 24
4.1.1.1.5 Menghitung Consistency Ratio (CR) 24
4.1.1.2 Hasil Alternatif Penggunaan Media Pembelajaran *Online* 25
4.1.1.2.1 Matriks Perbandingan Berpasangan Alternatif 25
4.1.1.2.2 Menentukan Nilai *Eigen* Alternatif 29
4.1.1.2.3 Menentukan Nilai Maksimum *Eigen* (λmaks) 35
4.1.1.2.4 Menghitung Nilai *Consistency Index* (CI) 37
4.1.1.2.5 Menghitung Nilai *Consistency Ratio* (CR) 38
4.1.2 Melihat Hasil Rekomendasi Kriteria dan Alternatif Penggunaan Media Pembelajaran *Online* dari Sudut Pandang Tenaga Pendidik 38
4.1.2.1 Bobot Peringkat Rekomendasi Kriteria dan Alternatif Penggunaan Media Pembelajaran *Online* dari Sudut Pandang Tenaga Pendidik 38
4.1.2.2 Hasil Perhitungan Bobot Peringkat pada Kotak Hierarki Masing-Masing Kriteria dan Alternatif 40
4.2 Pembahasan Penelitian 41
4.2.1 Menentukan Kriteria dan Alternatif Penggunaan Media Pembelajaran *Online* 41

4.2.2 Melihat Hasil Rekomendasi Kriteria dan Alternatif Penggunaan Media Pembelajaran *Online* dari Sudut Pandang Tenaga Pendidik 42
BAB V SIMPULAN, IMPLIKASI DAN SARAN 44
5.1 Simpulan 44
5.2 Implikasi 44
5.3 Saran 45
DAFTAR PUSTAKA 51
LAMPIRAN 56

DAFTAR GAMBAR

Gambar 3.1 Diagram Desain Penelitian 12
Gambar 3.2 Struktur Hirearki 14
Gambar 4.1 Hirearki Kriteria dan Alternatif..... 19
Gambar 4.2 Bobot Peringkat Kriteria dan Alternatif..... 40
Gambar 4.3 Hierarki Kriteria dan Alternatif dengan Nilai Bobot 40

DAFTAR TABEL

Tabel 3.1 *Matriks Perbandingan Berpasangan* 15
Tabel 3.2 *Skala Pairwise Comparison* 15
Tabel 3.3 *Nilai Indeks Random* 17
Tabel 4.1 *Kriteria dan Alternatif* 18
Tabel 4.2 *Hasil Pengisian Angket Perbandingan Berpasangan Kriteria dalam Desimal dan Hasil Geometric Mean* 22
Tabel 4.3 *Matriks Perbandingan Berpasangan Kriteria* 22
Tabel 4.4 *Jumlah Matriks Kriteria* 23
Tabel 4.5 *Matriks Hasil Normalisasi* 23
Tabel 4.6 *Jumlah Baris Matriks Perbandingan Berpasangan* 23
Tabel 4.7 *Nilai Bobot Prioritas Korea* 24
Tabel 4.8 *Hasil Pengisian Angket Perbandingan Berpasangan Antar Alternatif Terhadap K1 dalam Desimal dan Hasil Geometric Mean* 25
Tabel 4.9 *Matriks Perbandingan Berpasangan Alternatif Terhadap K1* 26
Tabel 4.10 *Hasil Pengisian Angket Perbandingan Berpasangan Antar Alternatif Terhadap K2 dalam Desimal dan Hasil Geometric Mean* 26
Tabel 4.11 *Matriks Perbandingan Berpasangan Alternatif Terhadap K2* 27
Tabel 4.12 *Hasil Pengisian Angket Perbandingan Berpasangan Antar Alternatif Terhadap K3 dalam Desimal dan Hasil Geometric Mean* 27
Tabel 4.13 *Matriks Perbandingan Berpasangan Alternatif Terhadap K3* 28
Tabel 4.14 *Hasil Pengisian Angket Perbandingan Berpasangan Antar Alternatif Terhadap K4 dalam Desimal dan Hasil Geometric Mean* 28
Tabel 4.15 *Matriks Perbandingan Berpasangan Alternatif Terhadap K4* 29
Tabel 4.16 *Jumlah Matriks Alternatif Terhadap K1* 29
Tabel 4.17 *Matriks Hasil Normalisasi* 30
Tabel 4.18 *Jumlah Baris Matriks Perbandingan Berpasangan Alternatif Terhadap K1* 30
Tabel 4.19 *Nilai Bobot Alternatif Terhadap K1* 30
Tabel 4.20 *Jumlah Matriks Alternatif Terhadap K2* 31
Tabel 4.21 *Matriks Hasil Normalisasi* 31z

Tabel 4.22 *Jumlah Baris Matriks Perbandingan Berpasangan Alternatif Terhadap K2* 32
Tabel 4.23 *Nilai Bobot Alternatif Terhadap K2* 32
Tabel 4.24 *Jumlah Matriks Alternatif Terhadap K3* 32
Tabel 4.25 *Matriks Hasil Normalisasi* 33
Tabel 4.26 *Jumlah Baris Matriks Perbandingan Berpasangan Alternatif Terhadap K3* 33
Tabel 4.27 *Nilai Bobot Alternatif Terhadap K3* 33
Tabel 4.28 *Jumlah Matriks Alternatif Terhadap K4* 34
Tabel 4.29 *Matriks Hasil Normalisasi* 34
Tabel 4.30 *Jumlah Baris Matriks Perbandingan Berpasangan Alternatif Terhadap K4* 35
Tabel 4.31 *Nilai Bobot Alternatif Terhadap K4* 35

DAFTAR LAMPIRAN

Lampiran 1. Surat Tugas Dosen Pembimbing 1 57
Lampiran 2. Surat Tugas Dosen Pembimbing 2 58
Lampiran 3. Angket Penelitian..... 59
Lampiran 4. Tabulasi Hasil Angket Penelitian..... 82

DAFTAR PUSTAKA

Akgunduz, D., & Akinoglu, O. (2016). The Effect of Blended Learning and Social Media-Supported Learning on the Students' Attitude and Self-Directed Learning Skills in Science Education. Turkish Online Journal of Educational Technology-TOJET, 15(2), 106-115.

Abdullah, L., Jaafar, S., & Taib, I. (2013). Ranking of Human Capital Indicators Using Analytic Hierarchy Process. Procedia - Social and Behavioral Sciences, 107, 22–28. https://doi.org/10.1016/j.sbspro.2013.12.394

Alqurashi, E. (2016). Self-efficacy in online learning environments: a literature review. Contemp. Issues Educ. Res. 9, 45–52. doi: 10.19030/cier.v9i1.9549

Aswir, Sofian Hadi, M., & Rosiana Dewi, F. (2021). Google Meet Application as an Online Learning Media for Descriptive Text Material. Jurnal Studi Guru dan Pembelajaran, Vol. 4, No. 1, 189-193. https://doi.org/10.30605/jsgp.4.1.2021.533

Brauers, W. K., & Zavadskas, E. K. (2006). The MOORA method and its application to privatization in a transition economy. Control and Cybernetics, 35(2), 445-469.

Benitez, J. M., Martin, J. C., & Roman, C. (2007). Using fuzzy number for measuring quality of service in the hotel industry. Tourism Management, 28(2), 544-555.

C. Garuti, V. A. P. Salomon. (2012). Compatibility indices between priority vectors. International Journal of the Analytic Hierarchy Process, Vol. 4, pp. 152-160.

Cabala and Pawel, 2010. Using the Analytic Hierarchy Process in Evaluating Decision Alternatives. Operations Research and Decision. No.1. pp.5-23.

Chen, T., & Wu, H. C. (2020). Assessing the suitability of smart technology applications for e-health using a judgment-decomposition analytic hierarchy process approach. Health and Technology, 10(3), 767–776. https://doi.org/10.1007/s12553-020-00408-7

Cho, Y. Y., and Woo, H. (2022). Factors in Evaluating Online Learning in Higher Education in the Era of a New Normal Derived from an Analytic Hierarchy Process (AHP) Based Survey in South Korea. Sustainability. 3066. 1-15. https://doi.org/10.3390/su14053066

Davies, L., & Bentrovato, D. (2011). Understanding education’s role in fragility; Synthesis of four situational analyses of education and fragility: Afghanistan, Bosnia and Herzegovenia, Cambodia, Liberia. International Institute for Educational Planning.

Dhamija, S., & Mehta, S. (2019). Design and Development of an Interactive E-Book: An Analysis. International Journal of Computer Applications, 975(8887), 24-28.

D. Dalalah, F. Al-Oqla, and M. Hayajneh. (2010). Application of the Analytic Hierarchy Process (AHP) in MultiCriteria Analysis of the Selection of Crane. Jordan Journal of Mechanical and Industrial Engineering. 4(5). 567 – 578.

Darko, A., Chan, A. P. C., Ameyaw, E. E., Owusu, E. K., Pärn, E., & Edwards, D. J. (2019). Review of application of analytic hierarchy process (AHP) in construction. International Journal of Construction Management, 19(5), 436–452. https://doi.org/10.1080/15623599.2018.1452098

E R Saputra and N Rusmana. (2020). Students' experience of online game-based assessment tool during emergency remote teaching. Journal of Physics: Conference Series. 1-5. doi:10.1088/1742-6596/1987/1/012012

El-Bishouty, H. M., & Mohamed, H. A. (2020). The Impact of Online Learning Experience on Student Outcomes in Higher Education. International Journal of Emerging Technologies in Learning (iJET), 15(22), 4-18.

Fitri, N. R., Afrizon, R., Hidayati, & Hufri. (2022). Meta-analysis of the influence of ICT based physics learning media on the learning outcomes of senior high school students. Pillar of Physics Education, 14(4), 274–282.

Filianie Aziz N, Sorooshian S, and Mahmud F. (2016). MCDM-AHP Method In Decision Makings. ARPN Journal of Engineering and Applied Sciences. 11(11). 7217-7220.

Hodges C, Moore S, Lockee B, Trust T and Bond A. (2020). The difference between emergency remote teaching and online learning. Educause review. 1-12.

Kamali, A., & Kianmehr, L. (2015). The paradox of online education: Images, perceptions, and interests. US-China Education Review, 5(9), 591-601.

Kittur, Javeed; C, Poornanand; R, Prajwal; P, Pavan R.; P, Pavankumar M.; P, Vishal; B, Vijeta; S, Vijaykumar; B J. (2015). Evaluating Optimal Generation using different Multi–Criteria Decision Making Methods. In: International Conference on Circuit, Power and Computing Technologies [ICCPCT].

Kukulska-Hulme, A., & Traxler, J. (2013). Design principles for mobile learning In M. Ally & A. Tsinakos (Eds.). Increasing access through mobile learning Commonwealth of Learning, 56-72.

Łatuszyńska A. (2014). Multiple-Criteria Decision Analysis Using Topsis Method For Interval Data In Research Into The Level Of Information Society Development Folia Oeconomica Stetin. 13, 2 p. 63–76.

Meng, H.-F., & Wu, X. (2016). Evaluation of blended learning models in computer graphics courses. International Journal of Information and Education Technology, 6(11), 853-857.

Martin, F., Ahlgrim-Delzell, L., and Budhrani, K. (2017). Systematic review of two decades (1995 to 2014) of research on synchronous online learning. Am. J. Dist. Educ. 31, 3–19. doi: 10.1080/08923647.2017.1264807

Mu, E., Florek-Paszkowska, A., & Pereyra-Rojas, M. (2022). Development of a Framework to Assess Challenges to Virtual Education in an Emergency Remote Teaching Environment: A Developing Country Student Perspective—The Case of Peru. *Education Sciences*, *12*(10). https://doi.org/10.3390/educsci12100704

N. Arnesil dan A. Hamid. (2015). Pengaruh Media Pembelajaran Online-Offline Dan Komunikasi Interpersonal Terhadap Hasil Belajar Peserta Bahasa Inggris. Jurnal Teknologi Informasi & Komunikasi dalam Pendidikan, Vol. 2, No. 1.

N. M. Napitupulu, T. Hardianti, dan Syahwin. (2018). Penggunaan Media Ular Tangga Berbasis Macromedia Flash Pada Materi GLB Dan GLBB Terhadap Hasil Belajar Siswa Di SMA Al-Washliyah Medan. Journal of Physics and Science Learning, Vol. 02 Nomor 2: 9-14.

Opricovic S and Tzeng G H, 2004 Compromise solution by MCDM methods: A comparative analysis of VIKOR and TOPSIS Eur. J. Oper. Res. 156, 2 p. 445–455.

Pant, S., Kumar, A., Ram, M., Klochkov, Y., & Sharma, H. K. (2022). Consistency Indices in Analytic Hierarchy Process: A Review. In Mathematics (Vol. 10, Issue 8, pp. 1–15). MDPI. https://doi.org/10.3390/math1008120

Panjaitan, M. I. (2019). Simple Additive Weighting (SAW) method in Determining Beneficiaries of Foundation Benefits. Jurnal Teknologi Komputer No.45 AB, 13(1), 19–25.

Power, M., & St-Jacques, J. (2013). Emotion in asynchronous online education: An exploration of universal themes in learner posts. The International Review of Research in Open and Distributed Learning, 14(3), 405-427.

Pratama, H., Azman, M. N. A., Kassymova, G. K., & Duisenbayeva, S. S. (2020). The Trend in Using Online Meeting Applications for Learning During the Period of Pandemic COVID-19: A Literature Review. Journal of Innovation in Educational and Cultural Research, 1(2), 58–68. https://doi.org/10.46843/jiecr.v1i2.15

Rahim R Nurarif S Ramadhan M Aisyah S and Purba W. (2017). Comparison Searching Process of Linear, Binary and Interpolation Algorithm J. Phys. Conf. Ser. 930, 1 p. 12007

Ramdhani, M. A., & Muhammadiyah, H. (2015). Proceeding International Conference of Islamic Education: Reforms, Prospects and Challenges Faculty of Tarbiyah and Teaching Training The Criteria of Learning Media Selection for Character Education in Higher Education. Proceeding International Conference of Islamic Education: Reforms, Prospects and Challenges Faculty of Tarbiyah and Teaching Training The Criteria of Learning Media Selection for Character Education in Higher Education, 174–182.

Ram M, Klochkov Y, Sharma H. (2022). Consistency Indices in Analytic Hierarchy Process: A Review. Mathematics. 10(8). 1-15.

R. Helilintar. (2016). Penerapan Metode SAW dan Fuzzy Dalam Sistem Pendukung Keputusan Penerimaan Beasiswa in Decision Support System Scholarship. Citec J.

S. M. Napitupulu, T. Hardianti, dan Syahwin. (2018). Penggunaan Media Ular Tangga Berbasis Macromedia Flash Pada Materi GLB Dan GLBB Terhadap Hasil Belajar Siswa Di SMA Al-Washliyah Medan. Journal of Physics and Science Learning, Vol. 02 Nomor 2: 9-14.

Sahronih, S., Purwanto, A., & Sumantri, M. S. (2019). The effect of interactive learning media on students' science learning outcomes. ACM International Conference Proceeding Series, Part F1483, 20–24. https://doi.org/10.1145/3323771.3323797

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1(1), 83-98.

Saaty, T. L. (1990). How to make a decision: The Analytic Hierarchy Process. European Journal of Operational Research, Vol.48, pp. 9-26.

Saaty, T. L. (2008). Decision Making with the Analytic Hierarchy Process. Int. J. Services Sciences, 83-98.

Saaty, T. L. (2000). Fundamentals of decision making and priority theory with the analytic hierarchy process. Pittsburgh (PA): RWS.

Saaty, T. L. (1980). The Analytic Hierarchic Process. New York: McGraw Hill.

Saaty, T. L. (1993). Decision Making for Leader: The Analytical Hierarchy Process for Decisions in Complex World, University of Pittsburgh, Pittburgh.

Saaty, T. L. (2008). Decision making with the analytic hierarchy process. International Journal of Services Sciences, 1(1), 83-98.

Saaty, T. L. (2000). Fundamentals of decision making and priority theory with the analytic hierarchy process. European Journal of Operational Research, Vol.48, pp. 9-26.

Setyani RE, Saputra R. (2016). Flood-prone Areas Mapping at Semarang City by Using Simple Additive Weighting Method. Procedia - Soc Behav Sci. 227. 378-386. https://doi:10.1016/j.sbspro.

Shen, D., Cho, M. H., Tsai, C. L., and Marra, R. (2013). Unpacking online learning experiences: online learning self-efficacy and learning satisfaction. Internet Higher Educ. 19, 10–17. doi: 10.1016/j.iheduc.2013.04.001

Siti Nor Fatimah Zuraidi, Mohammad Ashraf Abdul Rahman, Zainal Abidin Akasah. (2018). A Study of using AHP Method to Evaluate the Criteria and Attribute of Defects in Heritage Building. ICCEE 2018. E3S Web of Conferences 65. 1-14. https://doi.org/10.1051/e3sconf/20186501002

Sivo, S.A.; Ku, C.-H.; Acharya, P. Understanding how university student perceptions of resources affect technology acceptance in online learning courses. Australas. J. Educ. Technol. 2018, 34

Swan, K., & Dillon, P. D. (2001). Assessing the Effectiveness of Online Learning: A Meta-Analysis. Journal of Computing in Higher Education, 12(2), 3-25.

Torres Martín, C., Acal, C., El Honrani, M., and Mingorance Estrada, Á. C. (2021). Impact on the virtual learning environment due to COVID-19. Sustainability 13, 582. doi: 10.3390/su13020582

Toth-Stub, S. (2020). Countries Face an Online Education Learning Curve: The Coronavirus Pandemic Has Pushed Education Systems: Online, Testing Countries' Abilities to Provide Quality Learning for All.

UNESCO. (2020). COVID-19 Educational Disruption and Response. tersedia online: https://en.unesco.org/covid19/educationresponse

Vargas, L. G. (1990). An overview of the analytic hierarchy process and its applications. European Journal of Operational Research, 48(1), 2-8.

Wang, C. S., & Lin, S. L. (2019). How instructors evaluate an e-learning system? An evaluation model combining fuzzy AHP with association rule mining. Journal of Internet Technology, 20(6), 1947–1959. https://doi.org/10.3966/160792642019102006024

Wang, S., Liu, Y., Song, F., Xie, X., & Yu, D. (2021). Research on Evaluation System of User Experience with Online Live Course Platform. IEEE Access, 9, 23863–23875. https://doi.org/10.1109/ACCESS.2021.3054047

Wang, T. C., & Chen, Y. H. (2007). Applying consistent fuzzy preference relations to partnership selection. Omega, the International Journal of Management Science, 35, 384-388.

Williamson, B., Eynon, R., & Potter, J. (2020). Pandemic politics, pedagogies and practices: Digital technologies and distance education during the coronavirus emergency. Learning, Media and Technology, 45, 107–114.

Y D Kristanto, B Utomo, and N Sulistyani. (2020). Listening to the student voice on emergency remote teaching during the pandemic crisis. International Conference on Mathematics and Science Education. 5(1). 7-13.

Yildirim, K. (2020). Lessons from an exceptional distance education experience. Alanyazin, 1(1), 7-15.

Yoon, K., & Hwang, C. L. (1985). Manufacturing plant location analysis by multiple attribute decision making: Part II. Multi-plant strategy and plant relocation. International Journal of Production Research, 23(2), 361-370.