

**PERSONALISASI E-LEARNING  
BERBASIS MODEL GAYA BELAJAR FELDER-SILVERMAN:  
ANALISIS EFEKTIVITAS TERHADAP HASIL BELAJAR**

TESIS

diajukan untuk memenuhi sebagian syarat untuk memperoleh  
gelar Magister Pendidikan



Oleh

Alco Deri  
NIM 2110020

PROGRAM STUDI  
MAGISTER PENDIDIKAN ILMU KOMPUTER  
FAKULTAS PENDIDIKAN MATEMATIKA DAN  
ILMU PENGETAHUAN ALAM  
UNIVERSITAS PENDIDIKAN INDONESIA  
2023

## **LEMBAR HAK CIPTA**

# **PERSONALISASI E-LEARNING BERBASIS MODEL GAYA BELAJAR FELDER-SILVERMAN: ANALISIS EFEKTIVITAS TERHADAP HASIL BELAJAR**

**Oleh**  
**ALCO DERI**  
**NIM. 2110020**

Sebuah tesis yang diajukan untuk memenuhi salah satu syarat  
memperoleh gelar Magister Pendidikan Ilmu Komputer

© Alco Deri 2023  
Universitas Pendidikan Indonesia  
Desember 2023

Hak Cipta dilindungi undang-undang  
Proposal ini tidak boleh diperbanyak seluruhnya atau sebagian,  
dengan dicetak ulang, difoto kopi, atau dengan cara lainnya  
tanpa izin dari peneliti

**LEMBAR PENGESAHAN**  
**TESIS**

**PERSONALISASI E-LEARNING**  
**BERBASIS MODEL GAYA BELAJAR FELDER-SILVERMAN:**  
**ANALISIS EFEKTIVITAS TERHADAP HASIL BELAJAR**

**Oleh:**

**ALCO DERI**

**NIM. 2110020**

Disetujui dan disahkan oleh:

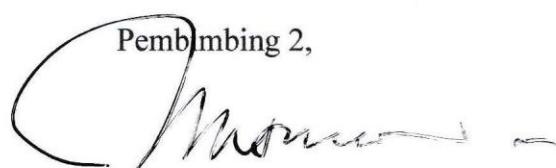
Pembimbing 1,



**Prof. Dr. H. Munir, M.IT.**

NIP. 196603252001121001

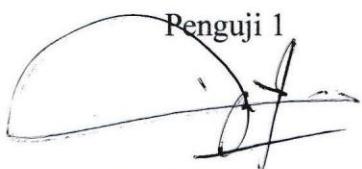
Pembimbing 2,



**Dr. M. Nursalman, M.T.**

NIP. 197909292006041002

Pengaji 1



**Prof. Dr. Lala Septem Riza, M.T.**

NIP. 197809262008121001

Pengaji 2



**Dr. Harja Santana Purba, M.Kom.**

NIP. 196307051989031002

Mengetahui,

Ketua Program Studi Magister Pendidikan Ilmu Komputer



**Prof. Dr. Lala Septem Riza, M.T.**

NIP. 197809262008121001

## ABSTRAK

Mengetahui gaya belajar peserta didik dapat membantu menciptakan pembelajaran yang lebih efektif, relevan, dan menarik, karena setiap individu peserta didik memiliki preferensi dalam cara mereka belajar dan memproses informasi yang sesuai dengan gaya belajarnya. Personalisasi E-learning digunakan untuk mengkustomisasi metode dan materi pembelajaran sehingga sesuai dengan preferensi gaya belajar masing-masing peserta didik. Penelitian ini bertujuan untuk menganalisis efektivitas penggunaan personal E-learning berdasarkan model gaya belajar Felder-Silverman (FSLSM) dalam meningkatkan hasil belajar peserta didik. Penelitian ini menggunakan metode mix method yang memanfaatkan kombinasi antara penelitian kuantitatif dan kualitatif. Kuantitatif terjadi ketika menganalisis data pengaruh efektivitas penggunaan E-learning untuk meningkatkan hasil belajar, sedangkan analisis kualitatif digunakan saat melakukan pengembangan Personalisasi E-learning serta media elektronik yang digunakan. Dengan berfokus pada pembelajaran menggunakan platform E-learning yang disesuaikan dengan preferensi gaya belajar individu, penelitian ini akan mengidentifikasi gaya belajar peserta didik melalui instrumen kuisioner Index of Learning Styles (ILS) yang terdigitalisasi. Penyediaan media pembelajaran dalam bentuk elektronik pada E-learning akan disesuaikan dengan gaya belajar masing-masing siswa, dan hasil belajar akan diukur melalui evaluasi pembelajaran. Perbandingan hasil belajar antara penggunaan personal E-learning dengan pembelajaran tanpa E-learning akan menjadi acuan untuk mengukur efektivitas dan pengaruh pendekatan personalisasi E-learning ini. Hasil penelitian menunjukkan bahwa berdasarkan pengujian statistik terdapat pengaruh yang signifikan dari penerapan personalisasi E-learning berdasarkan preferensi gaya belajar individu siswa terhadap hasil belajar siswa.

Kata Kunci: *Personalisasi E-learning, Gaya Belajar, Felder-Silverman, hasil belajar*

## ABSTRACT

Knowing students' learning styles can help create more effective, relevant and interesting learning, because each individual student has preferences in the way they learn and process information that suits their learning style. E-learning personalization is used to customize learning methods and materials so that they suit each student's learning style preferences. This research aims to analyze the effectiveness of using personal E-learning based on the Felder-Silverman learning style model (FSLSM) in improving student learning outcomes. This research uses a mix method which utilizes a combination of quantitative and qualitative research. Quantitative occurs when analyzing data on the influence of the effectiveness of using E-learning to improve learning outcomes, while qualitative analysis is used when developing Personalized E-learning and the electronic media used. By focusing on learning using an E-learning platform that is tailored to individual learning style preferences, this research will identify students' learning styles through the digitalized Index of Learning Styles (ILS) questionnaire instrument. The provision of learning media in electronic form in E-learning will be adjusted to each student's learning style, and learning outcomes will be measured through learning evaluations. A comparison of learning outcomes between the use of personal E-learning and learning without E-learning will be a reference for measuring the effectiveness and influence of this personalized E-learning approach. The research results show that based on statistical testing there is a significant influence from the application of personalized E-learning based on students' individual learning style preferences on student learning outcomes.

Keywords: *E-learning personalization, learning styles, Felder-Silverman, learning outcomes.*

## DAFTAR ISI

LEMBAR HAK CIPTA .....	i
LEMBAR PENGESAHAN .....	ii
PERNYATAAN.....	iii
UCAPAN TERIMA KASIH.....	iv
ABSTRAK .....	v
DAFTAR ISI.....	vi
DAFTAR TABEL.....	x
DAFTAR GAMBAR .....	xii
DAFTAR LAMPIRAN.....	xv
BAB I PENDAHULUAN .....	1
1.1 Latar Belakang Penelitian .....	1
1.2 Rumusan Masalah Penelitian .....	7
1.3 Tujuan Penelitian.....	8
1.4 Manfaat/Signifikansi Penelitian .....	8
1.5 Struktur Organisasi Tesis .....	9
BAB II KAJIAN PUSTAKA .....	11
2.1 E-learning dan Personalisasi E-learning .....	11
2.1.1 E-learning.....	11
2.1.2 Personalisasi E-learning.....	16
2.2 <i>Learning Management System</i> .....	20
2.2.1 LMS Moodle.....	23
2.2.2 <i>Plugin Questionnaire</i> .....	25
2.3 Pemilihan Konten E-learning yang Dipersonalisasi.....	25
2.4 Teori Gaya Belajar .....	28
2.4.1 Dimensi <i>Active-Reflective</i> .....	33
2.4.2 Dimensi <i>Sensing-Intuitive</i> .....	33
2.4.3 Dimensi <i>Visual-Verbal</i> .....	33
2.4.4 Dimensi <i>Sequential-Global</i> .....	34
2.5 Pengukuran Gaya Belajar.....	35
2.6 Hubungan Antara Gaya Belajar dan Hasil Belajar.....	37

2.7	Keunggulan dan Manfaat Personalisasi Konten E-learning.....	39
2.8	Dasar Program Keahlian Pemrograman Dasar.....	43
2.9	Penelitian Relevan.....	44
	BAB III METODE PENELITIAN.....	48
3.1	Desain Penelitian.....	48
3.2	Metode Pengembangan Perangkat Lunak .....	53
3.3	Partisipan .....	53
3.4	Instrumen Penelitian.....	53
3.4.1	Instrumen Validasi Ahli Materi dan Media .....	54
3.4.2	Instrumen Identifikasi Gaya Belajar .....	58
3.4.3	Instrumen Validasi Tes .....	59
3.5	Hipotesis Penelitian.....	64
3.6	Prosedur Penelitian.....	64
3.7	Analisis Data .....	68
3.7.1	Analisis Instrumen Validasi Materi dan Media .....	68
3.7.2	Analisis Instrumen Soal .....	70
3.7.3	Analisis Data Kuesioner Index of Learning Styles sesuai dengan model gaya belajar Felder-Silverman .....	76
3.7.4	Analisis Data Hasil Belajar.....	76
	BAB IV TEMUAN DAN PEMBAHASAN .....	81
4.1	Hasil Pengembangan E-learning yang dipersonalisasi berdasarkan model gaya belajar Felder-Silverman.....	81
4.1.1	Tahap Pra Penelitian .....	81
4.1.2	Tahap Analisis dan Desain .....	87
4.1.3	Tahap Pengembangan LMS .....	98
4.1.4	Tahap Penelitian .....	107
4.1.5	Tahapan Penilaian Hasil Penelitian .....	107
4.2	Hasil Validasi Instrumen .....	108
4.2.1	Temuan .....	108
4.2.2	Pembahasan .....	114
4.3	Hasil Identifikasi Gaya Belajar Peserta Didik.....	137
4.3.1	Temuan .....	138

4.3.2	Pembahasan .....	141
4.4	Pemilihan konten E-learning yang dipersonalisasi berdasarkan gaya belajar individu peserta didik .....	144
4.4.1	Temuan .....	145
4.4.2	Pembahasan .....	154
4.5	Hasil pembelajaran peserta didik sebelum dan sesudah dilakukan personalisasi E-learning .....	170
4.5.1	Temuan .....	171
4.5.2	Pembahasan .....	172
4.6	Menganalisis Data Hasil Belajar .....	174
4.6.1	Temuan .....	174
4.6.2	Pembahasan .....	180
	BAB V SIMPULAN, IMPLIKASI DAN REKOMENDASI .....	201
5.1	Simpulan.....	201
5.2	Implikasi.....	201
5.3	Rekomendasi .....	202
	DAFTAR PUSTAKA .....	203
	LAMPIRAN .....	211
	Lampiran 1: Struktur Kurikulum SMK TKJ.....	212
	Lampiran 2: Silabus .....	213
	Lampiran 3: Rencana Pelaksanaan Pembelajaran.....	215
	Lampiran 4: Instrumen Validasi Ahli Media .....	220
	Lampiran 5: Instrumen Validasi Ahli Materi.....	223
	Lampiran 6: Lembar Judgment Instrumen Soal.....	226
	Lampiran 7: Lembar Validasi Soal Tes .....	241
	Lampiran 8: Lembar Validasi Materi Soal.....	243
	Lampiran 9: Index of Learning Styles (ILS) Questionnaire .....	254
	Lampiran 10: Dokumentasi Implementasi Personalisasi E-learning .....	259
	Lampiran 11: Lembar Hasil Validasi Tes oleh Ahli Media.....	261
	Lampiran 12: Lembar Hasil Validasi Tes oleh Ahli Materi .....	264
	Lampiran 13: Lembar Hasil Validasi Tes Soal .....	267
	Lampiran 14: Lembar Hasil Judgment Instrument Soal oleh Ahli Materi.....	269

Lampiran 15: Proses Pengolahan Data Menggunakan Software R Studio .....	280
Lampiran 16: Script Media Simulasi Pemrograman Berbasis HTML.....	284

## DAFTAR TABEL

<b>Tabel 2. 1</b> Perbedaan pembelajaran konvensional dengan E-learning .....	14
<b>Tabel 2. 2</b> Langkah-langkah Personalisasi E-learning .....	19
<b>Tabel 2. 3</b> Fitur yang terdapat pada Learning Management System.....	22
<b>Tabel 2. 4</b> Karakteristik pembelajaran yang sesuai dengan media elektronik .....	26
<b>Tabel 2. 5</b> Dimensi gaya belajar dan mengajar (Felder & Silverman, 1989a) .....	32
<b>Tabel 3. 1</b> One-Group Pretest-Posttest.....	52
<b>Tabel 3. 2</b> Instrumen Validasi (LORI) versi 1.5 (terdiri 9 kriteria penilaian) .....	54
<b>Tabel 3. 3</b> Distribusi pertanyaan ILS sesuai dengan dimensi FSLSM .....	58
<b>Tabel 3. 4</b> Penskoran item kuisioner sesuai pilihan jawaban .....	59
<b>Tabel 3. 5</b> Instrumen Validasi Tes.....	60
<b>Tabel 3. 6</b> Kategori nilai pengetahuan siswa terhadap materi pembelajaran .....	62
<b>Tabel 3. 7</b> Kisi-kisi soal instrumen pertanyaan penelitian .....	63
<b>Tabel 3. 8</b> Distribusi Nilai Hasil Validasi LMS .....	69
<b>Tabel 3. 9</b> Kriteria Reliabilitas .....	73
<b>Tabel 3. 10</b> Klasifikasi Tingkat Kesukaran .....	74
<b>Tabel 3. 11</b> Interpretasi Daya Pembeda Soal.....	75
<b>Tabel 3. 12</b> Klasifikasi Kriteria Gain .....	80
<b>Tabel 4. 1</b> Hasil respon siswa terkait bidang studi dengan materi yang sulit dipahami .....	83
<b>Tabel 4. 2</b> Hasil Respon Siswa terkait dengan metode yang digunakan guru pada pembelajaran.....	83
<b>Tabel 4. 3</b> Hasil respon siswa terkait penggunaan media oleh guru selama pembelajaran.....	84
<b>Tabel 4. 4</b> Format RPP yang dipergunakan pada personalized learning .....	88
<b>Tabel 4. 5</b> Tahapan Pembelajaran Metode Personalized Learning .....	91
<b>Tabel 4. 6</b> Kriteria Penilaian yang terdapat pada Instrumen Validasi Materi .....	92
<b>Tabel 4. 7</b> Kriteria Penilaian yang terdapat pada Instrumen Validasi Media.....	93
<b>Tabel 4. 8</b> Kriteria Penilaian yang terdapat pada Instrumen Validasi Soal.....	94
<b>Tabel 4. 9</b> Main Storyboard.....	96
<b>Tabel 4. 10</b> Hasil Validasi Materi yang dilakukan oleh pakar .....	108

<b>Tabel 4. 11</b> Hasil Validasi Media yang dilakukan oleh pakar.....	110
<b>Tabel 4. 12</b> Hasil rekap validasi materi butir soal oleh pakar .....	111
<b>Tabel 4. 13</b> Hasil Uji Validitas Soal.....	112
<b>Tabel 4. 14</b> Hasil Uji Reliabilitas Soal .....	113
<b>Tabel 4. 15</b> Hasil Uji Tingkat Kesukaran .....	114
<b>Tabel 4. 16</b> Hasil Uji Daya Beda.....	114
<b>Tabel 4. 17</b> Kategori Kevalidan Soal .....	117
<b>Tabel 4. 18</b> Hasil Identifikasi Gaya Belajar Menggunakan ILS .....	138
<b>Tabel 4. 19</b> Hasil Gaya Belajar Semua Responden.....	140
<b>Tabel 4. 20</b> Preferensi Gaya Belajar Siswa .....	142
<b>Tabel 4. 21</b> Nilai Hasil Pretest.....	171
<b>Tabel 4. 22</b> Nilai Hasil Posttest .....	172
<b>Tabel 4. 23</b> Hasil Analisis Deskriptif Sebelum dan Sesudah Penerapan Personalisasi E-learning .....	172
<b>Tabel 4. 24</b> Perolehan nilai sebelum dilakukan personalisasi E-learning .....	174
<b>Tabel 4. 25</b> Hasil perhitungan statistik deskriptif pada nilai pretest sebelum dilakukan pembelajaran personalisasi E-learning .....	175
<b>Tabel 4. 26</b> Peroleh nilai evaluasi setelah dilakukan personalisasi E-learning ..	176
<b>Tabel 4. 27</b> Hasil perhitungan statistik deskriptif pada nilai setelah dilakukan evaluasi pembelajaran personalisasi E-learning .....	176
<b>Tabel 4. 28</b> Hasil perhitungan persentase ketuntasan klasikal .....	178
<b>Tabel 4. 29</b> Hasil Perhitungan nilai Z ketuntasan Klasikal .....	178
<b>Tabel 4. 30</b> Hasil Uji Normalitas.....	179
<b>Tabel 4. 31</b> Hasil uji-t (t-test) perbedaan dua rata-rata.....	179
<b>Tabel 4. 32</b> Analisis Indeks Gain .....	179
<b>Tabel 4. 33</b> Perbedaan nilai evaluasi sebelum dan sesudah dilakukan personalisasi E-learning .....	180
<b>Tabel 4. 34</b> Gaya Belajar Penyumbang Nilai Posttest Terbesar.....	181
<b>Tabel 4. 35</b> Selisih antar nilai pretest dan posttest .....	188
<b>Tabel 4. 36</b> Hasil Pengelompokan Gaya Belajar dan Gain Score .....	192

## DAFTAR GAMBAR

<b>Gambar 2. 1</b> Bangunan blok E-learning dan Pembelajaran offline .....	13
<b>Gambar 3. 1</b> Diagram Alir Penelitian .....	48
<b>Gambar 3. 2</b> Varian Metode Kombinasi (mix method).....	49
<b>Gambar 3. 3</b> Prosedur Penelitian .....	65
<b>Gambar 3. 4</b> Formulir skor sesuai dengan preferensi gaya belajar .....	76
<b>Gambar 4. 1</b> Flowchart Halaman Peserta Didik .....	95
<b>Gambar 4. 2</b> Antarmuka Halaman Awal User.....	99
<b>Gambar 4. 3</b> Halaman Depan atau Dashboard User.....	100
<b>Gambar 4. 4</b> Halaman Awal Kuisioner Gaya Belajar .....	101
<b>Gambar 4. 5</b> Halaman Menampilkan Soal Kuisioner Gaya Belajar.....	102
<b>Gambar 4. 6</b> Halaman Hasil Kuisioner Gaya Belajar.....	103
<b>Gambar 4. 7</b> Halaman Kursus Gaya Belajar Visual .....	104
<b>Gambar 4. 8</b> Halaman Soal Evaluasi Pembelajaran .....	105
<b>Gambar 4. 9</b> Halaman Hasil Pengerjaan Soal Evaluasi Pembelajaran .....	106
<b>Gambar 4. 10</b> Script Import Data Uji Validitas.....	119
<b>Gambar 4. 11</b> Script Persiapan Data Uji Validitas .....	120
<b>Gambar 4. 12</b> Script Jumlah Poin Individu untuk Variabel Uji Validitas.....	121
<b>Gambar 4. 13</b> Script Function Uji Validitas .....	122
<b>Gambar 4. 14</b> Script Uji Validitas Variabel X .....	123
<b>Gambar 4. 15</b> Script Import Data Uji Reliabilitas .....	124
<b>Gambar 4. 16</b> Script Persiapan Data Uji Reliabilitas .....	126
<b>Gambar 4. 17</b> Script Jumlah Poin Individu untuk Variabel Uji Reliabilitas ....	126
<b>Gambar 4. 18</b> Script Function Uji Reliabilitas .....	127
<b>Gambar 4. 19</b> Script Uji Reliabilitas Variabel X.....	129
<b>Gambar 4. 20</b> Script Uji Tingkat Kesukaran .....	130
<b>Gambar 4. 21</b> Script Hasil Uji Tingkat Kesukaran.....	132
<b>Gambar 4. 22</b> Script Print (TK) .....	132
<b>Gambar 4. 23</b> Tampilan script uji daya beda pada kelompok atas .....	134
<b>Gambar 4. 24</b> Tampilan script uji daya beda pada kelompok bawah.....	135
<b>Gambar 4. 25</b> Script jumlah benar dalam kelompok atas.....	135

<b>Gambar 4. 26</b> Script jumlah benar dalam kelompok bawah.....	136
<b>Gambar 4. 27</b> Script Hasil Uji Daya Beda .....	137
<b>Gambar 4. 28</b> Visualisasi bipolar gaya belajar dari semua responden .....	141
<b>Gambar 4. 29</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar active .....	146
<b>Gambar 4. 30</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar reflective .....	147
<b>Gambar 4. 31</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar sensing .....	148
<b>Gambar 4. 32</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar intuitive .....	149
<b>Gambar 4. 33</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar visual .....	150
<b>Gambar 4. 34</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar verbal .....	151
<b>Gambar 4. 35</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar sequential .....	152
<b>Gambar 4. 36</b> Tampilan materi dan kursus yang bisa diakses oleh peserta didik yang memiliki gaya belajar global .....	153
<b>Gambar 4. 37</b> Tampilan Menu Editor Heyzine Flipbook Maker .....	154
<b>Gambar 4. 38</b> Tampilan Media Pembelajaran Simulasi Algoritma.....	156
<b>Gambar 4. 39</b> Tampilan memasukan text editor HTML kedalam page module	157
<b>Gambar 4. 40</b> Script HTML Markup.....	158
<b>Gambar 4. 41</b> Script External link ke web sumber.....	159
<b>Gambar 4. 42</b> Script untuk melakukan konfigurasi default dan tema warna ....	159
<b>Gambar 4. 43</b> Script Update dan Inisialisasi Editor .....	160
<b>Gambar 4. 44</b> Script simpan format PNG .....	161
<b>Gambar 4. 45</b> Script simpan format SVG .....	162
<b>Gambar 4. 46</b> Script event listener untuk tombol tema dan simpan.....	162
<b>Gambar 4. 47</b> Script Inisialisasi editor ace .....	163
<b>Gambar 4. 48</b> Script fungsi update flowchart.....	164
<b>Gambar 4. 49</b> Tampilan beranda aplikasi interaktif lumi education .....	165

<b>Gambar 4. 50</b> Tampilan dashboard dari konten yang sudah dibuat .....	166
<b>Gambar 4. 51</b> Tampilan media elektronik dengan karakteristik teks dan audio	167
<b>Gambar 4. 52</b> Pemanfaatan Forum Group didalam LMS.....	168
<b>Gambar 4. 53</b> Tampilan wiki terpasang pada sebuah media pembelajaran.....	168
<b>Gambar 4. 54</b> Tampilan menu chat pada user siswa .....	169
<b>Gambar 4. 55</b> Chart Fitur LMS yang Sering digunakan Siswa.....	170
<b>Gambar 4. 56</b> Chart kelompok gaya belajar berdasarkan kategori gain score ..	183
<b>Gambar 4. 57</b> Grafik Sebaran siswa berdasarkan Grade (nilai posttest) .....	183
<b>Gambar 4. 58</b> Analisis Paired T-Test mengimport data excel ke R-Studio .....	184
<b>Gambar 4. 59</b> Import Library untuk perhitungan Dekscriptif dan Pembuatan Grafik Plot .....	184
<b>Gambar 4. 60</b> Grafik Plot yang Menampilkan Perbedaan nilai Posttest dan Pretest .....	185
<b>Gambar 4. 61</b> Script Analisis Deskriptif .....	185
<b>Gambar 4. 62</b> Menghitung selisih antar pretest dan posttest.....	188
<b>Gambar 4. 63</b> Hasil Uji Normalitas pada Selisih menggunakan Shapiro Wilk Test .....	189
<b>Gambar 4. 64</b> Hasil Paired T-Test.....	190
<b>Gambar 4. 65</b> Chart Pengelompokan Grade dan Gain Score Setiap Siswa.....	194
<b>Gambar 4. 66</b> Chart Pengelompokan Gaya Belajar Active dan Reflective.....	195
<b>Gambar 4. 67</b> Chart Pengelompokan Gaya Belajar Sensing dan Intuitive.....	196
<b>Gambar 4. 68</b> Chart Pengelompokan Gaya Belajar Visual dan Verbal.....	197
<b>Gambar 4. 69</b> Chart Pengelompokan Gaya Belajar Sequential dan Global .....	198
<b>Gambar 4. 70</b> Perintah Persiapan Data Analisis Gain Score .....	198
<b>Gambar 4. 71</b> Analisis Gain Score menggunakan R-Studio .....	199
<b>Gambar 4. 72</b> Tampilan setelah pembagian pengklasifikasian tabel.....	200

## **DAFTAR LAMPIRAN**

Lampiran 1: Struktur Kurikulum SMK TKJ.....	212
Lampiran 2: Silabus .....	213
Lampiran 3: Rencana Pelaksanaan Pembelajaran.....	215
Lampiran 4: Instrumen Validasi Ahli Media .....	220
Lampiran 5: Instrumen Validasi Ahli Materi.....	223
Lampiran 6: Lembar Judgment Instrumen Soal.....	226
Lampiran 7: Lembar Validasi Soal Tes .....	241
Lampiran 8: Lembar Validasi Materi Soal.....	243
Lampiran 9: Index of Learning Styles (ILS) Questionnaire .....	254
Lampiran 10: Dokumentasi Implementasi Personalisasi E-learning .....	259
Lampiran 11: Lembar Hasil Validasi Tes oleh Ahli Media.....	261
Lampiran 12: Lembar Hasil Validasi Tes oleh Ahli Materi .....	264
Lampiran 13: Lembar Hasil Validasi Tes Soal .....	267
Lampiran 14: Lembar Hasil Judgment Instrument Soal oleh Ahli Materi.....	269
Lampiran 15: Proses Pengolahan Data Menggunakan Software R Studio .....	280
Lampiran 16: Script Media Simulasi Pemrograman Berbasis HTML.....	284

## DAFTAR PUSTAKA

- Ahmad, N., Tasir, Z., Kasim, J., & Sahat, H. (2013). Automatic Detection of Learning Styles in Learning Management Systems by Using Literature-based Method. *Procedia - Social and Behavioral Sciences*, 103, 181–189. <https://doi.org/10.1016/j.sbspro.2013.10.324>
- Aissaoui, O. El, El Madani, Y. E. A., Oughdir, L., & Alloui, Y. El. (2019). Combining supervised and unsupervised machine learning algorithms to predict the learners' learning styles. *Procedia Computer Science*, 148, 87–96. <https://doi.org/10.1016/j.procs.2019.01.012>
- Altinpulluk, H., & Kesim, M. (2021). a Systematic Review of the Tendencies in the Use of Learning Management Systems. *Turkish Online Journal of Distance Education*, 22(3), 1–14. <https://doi.org/10.17718/tojde.961812>
- Arafeh, L. (2017). A neurofuzzy-based quality of eLearning model. *Inderscienceonline.Com*.
- Araka, E., Maina, E., Gitonga, R., Oboko, R., & Kihoro, J. (2021). University Students' Perception on the Usefulness of Learning Management System Features in Promoting Self-Regulated Learning in Online Learning Eric Araka Technical University of Kenya, Kenya Robert Oboko University of Nairobi, Kenya John Kihoro. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 17(1), 45–64.
- Arikunto, Suharsimi. (2021). Dasar-dasar evaluasi pendidikan. *Bumi Aksara*, edisi 3.
- Assar, S., and A. L. Franzoni. (2009). ‘Student learning styles adaptation method based on teaching strategies and electronic media. A report.’ *Educational Technology & Society* 12.4 (): 15-40.
- Avlijaš, G., Heleta, M., & Avlijaš, R. (2016). *A Guide for Association Rule Mining in Moodle Course Management System*. 56–61. <https://doi.org/10.15308/sinteza-2016-56-61>
- Azrai, E. P., Ernawati, E., & Sulistianingrum, G. (2018). Ragam Gaya Belajar Siswa SMA Menurut David Kolb dalam Pembelajaran Biologi. *Jurnal Al-Azhar Indonesia Seri Humaniora*, 4(4), 251. <https://doi.org/10.36722/sh.v4i4.302>
- Bourkoukou, O., Bachari, E. El, & Adnani, M. El. (2016). A Personalized E-Learning Based on Recommender System. *International Journal of Learning*, 2(2), 99–103. <https://doi.org/10.18178/IJLT.2.2.99-103>
- Brahmantio, D. I., & Anistyasari, Y. (2020). Studi Literatur Pengaruh Gaya Belajar terhadap E-Learning Adaptive Berbasis Web. *Jurnal IT-EDU*, 05(01), 362–370.
- Brown, H. D. (1985). Language learning and teaching. In *Language Teaching* (Vol. 18, Issue 2). <https://doi.org/10.1017/S0261444800011472>
- Bruning, R. V. F. and K. (2005). *Harnessing the Power of the Information Age: E-learning - New Frontier of Organizational Training*.
- Cassidy, S. (2004). Learning styles: An overview of theories, models, and measures. *Educational Psychology*, 24(4), 419–444. <https://doi.org/10.1080/0144341042000228834>

- Caudill, J. G. (2015). Employee Motivations for Workplace Learning and the Role of Elearning in the Workplace. *Internet Learning*, 4(2). <https://doi.org/10.18278/il.4.2.3>
- Celce-Murcia, M. (2001). *Teaching English as a Second or Foreign Language (3rd Edition)*.
- Chan, A. K. M., Botelho, M. G., & Lam, O. L. T. (2021). An exploration of student access to a learning management system—challenges and recommendations for educators and researchers. *European Journal of Dental Education*, 25(4), 846–855. <https://doi.org/10.1111/eje.12664>
- Chauvin, J. (1982). Individualized instruction: Implications for the gifted. *Roeper Review*, 5(1), 2–3. <https://doi.org/10.1080/02783198209552645>
- Chen, P. S. D., Lambert, A. D., & Guidry, K. R. (2010). Engaging online learners: The impact of Web-based learning technology on college student engagement. *Computers and Education*, 54(4), 1222–1232. <https://doi.org/10.1016/j.compedu.2009.11.008>
- Dalva Novela, D. (2022). The Relationship of Learning Styles and Student's Chemistry Learning Outcomes. *JRPK: Jurnal Riset Pendidikan Kimia*, 12(1), 25–31. <https://doi.org/10.21009/jrpk.121.04>
- Devarakonda, S. (2019). Calculating the Economic Viability of Corporate Trainings (Traditional & eLearning) using Benefit-Cost Ratio (BCR) and Return on Investment (ROI). *International Journal of Advanced Corporate Learning (IJAC)*, 12(1), 41. <https://doi.org/10.3991/ijac.v12i1.9735>
- Dixon, K. (2014). Moodle Introduction What is Moodle? The different areas in a Moodle course include: Moodle Introduction the Activities Block. *Adelphi University*, 1–6.
- Duangkanong, D., & Vate-U-Lan, P. (2019). Development of an ELearning Model to Facilitate Internal Communication. *Nida Development Journal*.
- El Aissaoui, O., El Alami El Madani, Y., Oughdir, L., & El Alloui, Y. (2019). A fuzzy classification approach for learning style prediction based on web mining technique in e-learning environments. *Education and Information Technologies*, 24(3), 1943–1959. <https://doi.org/10.1007/s10639-018-9820-5>
- Falah, B. N. (2019). Pengaruh Gaya Belajar Siswa Dan Minat Belajar. *Euclid*, 6(1), 25–34.
- Fathurrahman, Laksitowening, & Suwati. (2022). Penerapan Metode Collaborative Filtering Untuk Personalized Learning Content Pada Learning Management System (LMS). *JURIKOM (Jurnal Riset Komputer)*, 9(2), 257. <https://doi.org/10.30865/jurikom.v9i2.3887>
- Fatmawati, F., Khaeruddin, K., Haris, A., Palloan, P., & Usman, U. (2022). Relationship Between Learning Styles and Physics Learning Outcomes of Class X Science Students. *Jurnal Pendidikan Fisika*, 10(3), 237–247. <https://doi.org/10.26618/jpf.v10i3.8987>
- Felder, R. M., & Brent, R. (2016). *Teaching and Learning in STEM: a Practical Guide*.
- Felder, S. (2014). Index of Learning Styles (ILS) Learning Style Questionnaire. *Academic Skills Advice*, 1–12.
- Felder, & Silverman. (1989a). Learning and Teaching Styles in Engineering Education. *BioCycle*, 30(10), 66–67.
- Felder, & Silverman. (1989b). Learning and Teaching Styles in Engineering Education. *BioCycle*, 30(10), 66–67.

- Felder; Solomon. (2014). Index of Learning Styles (ILS) Learning Style Questionnaire. *Academic Skills Advice*, 1–12.
- Felder, & Spurlin, J. (2005). Applications, reliability and validity of the index of learning styles. *International Journal of Engineering Education*, 21(1 PART 1), 103–112.
- Fitzgerald, R., Rossiter, E., & Thompson, T. J. (2021). A Personalized Approach to Flexible Learning. *Proceedings of the 21St European Conference on E-Learning, Ecel*, 105–110.
- Fok, A. W. P., & Ip, H. H. S. (2004). *Personalized Education: An Exploratory Study of Learning Pedagogies in Relation to Personalization Technologies*. 407–415.
- Frank Coffield. (2004a). learning style and pedagogy in post-16 learning: A systematic and critical review. *Learning and Skills Research Centre*.
- Frank Coffield. (2004b). learning style and pedagogy in post-16 learning: A systematic and critical review. *Learning and Skills Research Centre*. [www.LSRC.ac.uk](http://www.LSRC.ac.uk)
- Gomes, A., Santos, Á., Carmo, L., & Mendes, A. J. (2007). Learning styles in an e-learning tool. *ISEC - Engineering Institute of Coimbra CISUC - Department of Informatics Engineering*, 5.
- González Jaimes, E. I., & López Chau, A. (2021). Analysis of the Moodle Learning Management System and user comfort levels. *Edutec. Revista Electrónica de Tecnología Educativa*, 75, 110–123. <https://doi.org/10.21556/edutec.2021.75.1771>
- Graf, S. (2007). Adaptivity in Learning Management Systems Focussing on Learning Styles. *PhD Thesis, December 2007*, 185.
- Grant, Peggy, and D. Basye. (2014). Personalized learning: A guide for engaging students with technology. *International Society for Technology in Education*.
- Gürhan Durak, S. Ç. (2019). Learning Management Systems: Popular LMSs and Their Comparison. *Igi-Global*. <https://doi.org/10.4018/978-1-5225-6255-9.ch016>
- Hamid, A. A. (2002). Hamid - 2001 - e-Learning. *Journal Internet and Higher Education*, 4, 311–316.
- Hawkins, B. L., & Rudy, J. A. (2008). *EDUCAUSE core data service fiscal year 2007 summary report*.
- Huang, M. J., Huang, H. S., & Chen, M. Y. (2007). Constructing a personalized e-learning system based on genetic algorithm and case-based reasoning approach. *Expert Systems with Applications*, 33(3), 551–564. <https://doi.org/10.1016/j.eswa.2006.05.019>
- Imran, H., Belghis-Zadeh, M., Chang, T.-W., Kinshuk, & Graf, S. (2016). PLORS: a personalized learning object recommender system. *Vietnam Journal of Computer Science*, 3(1), 3–13. <https://doi.org/10.1007/s40595-015-0049-6>
- Irawati, I., Ilhamdi, M. L., & Nasruddin, N. (2021). Pengaruh Gaya Belajar Terhadap Hasil Belajar IPA. *Jurnal Pijar Mipa*, 16(1), 44–48. <https://doi.org/10.29303/jpm.v16i1.2202>
- Jati, G. (2013). Learning Management System (moodle) And E-Learning Content Development. *Jurnal Sosioteknologi*, 12(28), 277–289. <https://doi.org/10.5614/sostek.itbj.2013.12.28.3>
- Jennings, C. (2014). Speaking Your Mind: Using elements of narrative storytelling in eLearning. *Elearnmag.Acm*.
- Kanninen, E. (2008). *Learning Styles And E-Learning Master of Science Thesis*. 1–76.

- Keefe, J. W. (1985). Assessment of Learning Style Variables: The NASSP Task Force Model. *Theory Into Practice*, 24(2), 138–144. <https://doi.org/10.1080/00405848509543162>
- Khan, B. H., & Joshi, V. (2006). E-Learning Who, What and How? *Journal of Creative Communications*, 1(1), 61–74. <https://doi.org/10.1177/097325860500100104>
- Kinshuk, Liu, T. C., & Graf, S. (2009). Coping with mismatched courses: Students' behaviour and performance in courses mismatched to their learning styles. *Educational Technology Research and Development*, 57(6), 739–752. <https://doi.org/10.1007/s11423-009-9116-y>
- Klašnja-Milićević, A., Vesin, B., Ivanović, M., & Budimac, Z. (2011). E-Learning personalization based on hybrid recommendation strategy and learning style identification. *Computers and Education*, 56(3), 885–899. <https://doi.org/10.1016/j.compedu.2010.11.001>
- Klitmøller, J. (2015). Review of the methods and findings in the Dunn and Dunn learning styles model research on perceptual preferences. In *Nordic Psychology* (Vol. 67, Issue 1, pp. 2–26). Routledge. <https://doi.org/10.1080/19012276.2014.997783>
- Kolb, A. Y., & Kolb, D. A. (1998a). Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Huagong Kuangshan Jishu/Technology for Chemical Mines*, 27(4), 46–50.
- Kolb, A. Y., & Kolb, D. A. (1998b). Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education. *Huagong Kuangshan Jishu/Technology for Chemical Mines*, 27(4), 46–50.
- Koneru, I. (2017). Exploring moodle functionality for managing Open Distance Learning e-assessments. *Turkish Online Journal of Distance Education*, 18(4), 129–141. <https://doi.org/10.17718/tojde.340402>
- Kusworo, N., Soepriyanto, Y., & Husna, A. (2021). Pengembangan Adaptive E-Learning Sistem Berbasis Vark Learning Style Pada Materi IP Address. *JKTP: Jurnal Kajian Teknologi Pendidikan*, 4(1), 70–79. <https://doi.org/10.17977/um038v4i12021p070>
- Lothridge, K., Fox, J., & Fynan, E. (2013). Blended learning: efficient, timely and cost effective. *Australian Journal of Forensic ....* <https://doi.org/10.1080/00450618.2013.767375>
- Madhubala, R., & Akila. (2020). Context-Aware Personalized Mobile Learning. *Advances in Intelligent Systems and Computing*, 1034, 469–481. [https://doi.org/10.1007/978-981-15-1084-7\\_45](https://doi.org/10.1007/978-981-15-1084-7_45)
- Maina, E. M., & Kihoro, J. M. (2017). Learner experience of e-learning mode in institutions of higher learning: A case of Kenyan Universities. *2017 IST-Africa Week Conference, IST-Africa 2017*, 1–9. <https://doi.org/10.23919/ISTAFRICA.2017.8102397>
- Marantika, J. E. R. (2022). The relationship between learning styles, gender and learning outcomes. *Cypriot Journal of Educational Sciences*, 17(1), 56–67. <https://doi.org/10.18844/cjes.v17i1.6681>
- Maria Dimova, C., & Stirk, P. M. R. (2019). The Relationship Between Learning Styles and Learning Outcomes for Adults in an Informal Educational Setting. *Dissertation, December*, 9–25.
- McClaskey, B. B. and K. (2015a). Personalization vs. Differentiation vs. Individualization Report (PDI). *LLC The PDI Chart Explained*, 1–10. [www.personalizelearning.com](http://www.personalizelearning.com)

- McClaskey, B. B. and K. (2015b). Personalization vs. Differentiation vs. Individualization Report (PDI). *LLC The PDI Chart Explained*, 1–10.
- Montenegro-Marin, C. E., Cueva-Lovelle, J. M., Sanjuan-Martinez, O., & Gaona-Garcia, P. A. (2010). Modeling And Comparison Study of Modules in Open Source Lms Platforms with Cmapstool. *International Journal of Interactive Multimedia and Artificial Intelligence*, 1(3), 37. <https://doi.org/10.9781/ijimai.2010.137>
- Motah, M. (2007). Learning, types of learning, traditional learning styles and the impact of e-learning on the performance of secondary school students: The perception of teachers. *Proceedings of the 2007 Computer Science and IT Education Conference Learning*, 483–498.
- Mtebe, J. S. (2015). Learning Management System success: Increasing Learning Management System usage in higher education in sub-Saharan Africa. *International Journal of Education and Development Using Information and Communication Technology*, 11(2), 51–64.
- Munir. (2009). Pembelajaran jarak jauh berbasis teknologi informasi dan komunikasi. *Bandung: Alfabeta*.
- Munir. (2012). Multimedia konsep dan aplikasi dalam pendidikan. In *Alfabeta* (Vol. 58, Issue 12).
- Murphy, Marilyn, Sam Redding, and Janet Twyman, Eds. (2016). Handbook on personalized learning for states, districts, and schools. *IAP*.
- Murray, M. C., & Perez, J. (2015). *Informing and Performing: A Study Comparing Adaptive Learning to Traditional Learning Part of the Databases and Information Systems Commons*. 18, 111–125.
- Nafea, S. M., Siewe, F., & He, Y. (2018). Ulearn: Personalised learner's profile based on dynamic learning style questionnaire. In *Advances in Intelligent Systems and Computing* (Vol. 869). Springer International Publishing. [https://doi.org/10.1007/978-3-030-01057-7\\_81](https://doi.org/10.1007/978-3-030-01057-7_81)
- Nesbit, J. C., & Li, J. (2004). *Web-Based Tools for Learning Object Evaluation*. [www.dlnet.vt.edu](http://www.dlnet.vt.edu)
- Ningrat, sayu putri, Tegeh, M., & Sumantri, M. (2018). Kontribusi Gaya Belajar Dan Motivasi Belajar Terhadap Hasil Belajar Bahasa Indonesia. *Jurnal Ilmiah Sekolah Dasar*, 2(3), 1–9.
- Novita, N. (2022). The Relationship between Student Learning Styles and Mathematics Learning Outcomes in Set Materials in Class VII MTs Daarul Falah. *Intelektium*, 3(2), 396–402. <https://doi.org/10.37010/int.v3i2.1086>
- Ntshwarang, P. N., Malinga, T., & Losike-Sedimo, N. (2021). eLearning Tools at the University of Botswana: Relevance and Use Under COVID-19 Crisis. *Higher Education for the Future*, 8(1), 142–154. <https://doi.org/10.1177/2347631120986281>
- Ovariyanti, A. S., & Santoso, and H. B. (2016). An Adaptation of the Index of Learning Style (ILS) to Indonesian Version: *IEEE*.
- Pardomuan, G. N. P. N. (2020). Sistem Personalisasi E-Learning Berorientasi Felder Silverman Learning Style Model Pada Mata Pelajaran Teknik Pengambilan Gambar. *Jurnal Edutech Undiksha*, 8(1), 167. <https://doi.org/10.23887/jeu.v8i1.26252>
- Patrick, S., Kennedy, K., & Powell, A. (2013). Mean What You Say: Defining and Integrating Personalized, Blended and Competency Education President and Chief Executive Officer, iNACOL. *International Association for K-12 Online Learning*.

- Pham, Q. D., & Florea, A. M. (2013). A method for detection of learning styles in learning management systems. *UPB Scientific Bulletin, Series C: Electrical Engineering*, 75(4), 3–12.
- Premlatha, K. R., & Geetha, T. V. (2015). Learning content design and learner adaptation for adaptive e-learning environment: a survey. *Artificial Intelligence Review*, 44(4), 443–465. <https://doi.org/10.1007/s10462-015-9432-z>
- Raharja, S., Prasojo, L. D., Ariyawan, D., & Nugroho, A. (2011). Model Pembelajaran Berbasis Learning Management System Dengan Pengembangan Software Moodle Di Sekolah Menengah Atas Learning Model Based Learning Management System with Software Development Based Moodle at Seior High School. *Jurnal Kependidikan*, 41 No. 1(2), 34–44.
- Rahman, M. M., Abdullah, N. A., & Aurangozeb, F. (2017). A framework for designing a personalised web-based search assistant tool for eLearning. *2017 5th International Conference on Information and Communication Technology, ICoICT 2017*, 0(c), 1–6. <https://doi.org/10.1109/ICoICT.2017.8074712>
- Rawashdeh, A. Z. Al, Mohammed, E. Y., Arab, A. R. Al, Alara, M., & Al-Rawashdeh, B. (2021). Advantages and disadvantages of using E-learning in university education: Analyzing students' perspectives. *Electronic Journal of E-Learning*, 19(2), 107–117. <https://doi.org/10.34190/ejel.19.3.2168>
- Redzuan, F., Lokman, A. M., Othman, Z. A., & Abdullah, S. (2011). Kansei design model for eLearning: A preliminary finding. *Proceedings of the European Conference on Games-Based Learning*, 2(April 2016), 658–669.
- Renato R. Maaliw III. (2020). Adaptive Virtual Learning Environment based on Learning Styles for Personalizing E-learning System: Design and Implementation. *International Journal of Recent Technology and Engineering (IJRTE)*, 8(6), 3398–3406. <https://doi.org/10.35940/ijrte.f8901.038620>
- Rosenthal, M. (2016). Qualitative research methods: Why, when, and how to conduct interviews and focus groups in pharmacy research. *Currents in Pharmacy Teaching and Learning*, 8(4), 509–516. <https://doi.org/10.1016/j.cptl.2016.03.021>
- Rusnayati, H., & Putri, W. O. N. (2022). the Relationship Between Bimodal Learning Styles and Student'S Learning Outcomes in Work and Energy Topics. *Journal of Teaching and Learning Physics*, 7(2), 72–77. <https://doi.org/10.15575/jotlp.v7i2.18211>
- Sahabudin, N. A., & Ali, M. B. (2013). Personalized Learning and Learning Style among Upper Secondary School Students. *Procedia - Social and Behavioral Sciences*, 103(2007), 710–716. <https://doi.org/10.1016/j.sbspro.2013.10.391>
- Saifuddin, Much. F. (2018). E-Learning dalam Persepsi Mahasiswa. *Jurnal VARIDIKA*, 29(2), 102–109. <https://doi.org/10.23917/varidika.v29i2.5637>
- Samsara, L., Cahyarini, B. R., & Kusuma, H. B. (2022). The Implementation of an Integrated Learning Management System: Challenges in the Indonesian Bureaucratic Organizational Structure. *KnE Social Sciences*, 2022, 715–726. <https://doi.org/10.18502/kss.v7i9.10973>
- Shemshack, A., & Spector, J. M. (2020). A systematic literature review of personalized learning terms. *Smart Learning Environments*, 7(1). <https://doi.org/10.1186/s40561-020-00140-9>
- Sihombing, J. H. (2020). Personalized E-Learning Content Based on Felder-Silverman Learning Style Model. *2020 8th International Conference on*

- Information and Communication Technology, ICoICT 2020.*  
<https://doi.org/10.1109/ICoICT49345.2020.9166452>
- Simonics, I. (2013). Changing of multimedia elements in elearning development. *ICETA 2013 - 11th IEEE International Conference on Emerging ELearning Technologies and Applications, Proceedings*, 345–349. <https://doi.org/10.1109/iceta.2013.6674456>
- Slavin, R. E. (1977). A student team approach to teaching adolescents with special emotional and behavioral needs. *Psychology in the Schools*, 14(1), 77–84. [https://doi.org/10.1002/1520-6807\(197701\)14:1<77::AID-PITS2310140116>3.0.CO;2-C](https://doi.org/10.1002/1520-6807(197701)14:1<77::AID-PITS2310140116>3.0.CO;2-C)
- Soloman, B. a, Carolina, N., & Felder, R. M. (2012). Index of Learning Styles Questionnaire. *Learning, January 1999*, 1–5.
- Sternberg, R. J. (1994). ‘Allowing for Thinking Styles.’ *Educational Leadership* 52.3 (): 36-40.
- Subashini, P., Krishnaveni, M., Dhivyaprabha, T. T., Preethi, B., Hayar, A., Elhanafi, M. E., Joundi, M., & Kheddioui, E. (2019). Personalized elearning open platform for alphabetization awareness in rural areas of Morocco. *5th IEEE International Smart Cities Conference, ISC2 2019*, 22–29. <https://doi.org/10.1109/ISC246665.2019.9071720>
- Sugiyono. (2017). *Metode Penelitian*.
- Sugiyono. (2019a). Metode Penelitian Pendidikan (kuantitatif, kualitatif, kombinasi, R&D dan Penelitian Pendidikan). *Alfabeta, Bandung*.
- Sugiyono. (2019b). Metode Penelitian Pendidikan (kuantitatif, kualitatif, kombinasi, R&D dan Penelitian Pendidikan). *Alfabeta, Bandung*.
- Syamsuar, S., & Reflianto, R. (2019). Pendidikan Dan Tantangan Pembelajaran Berbasis Teknologi Informasi Di Era Revolusi Industri 4.0. *E-Tech: Jurnal Ilmiah Teknologi Pendidikan*, 6(2). <https://doi.org/10.24036/et.v2i2.101343>
- Thyagarajan, K. K., & Nayak, R. (2007). Adaptive Content Creation for Personalized e-Learning Using Web Services. *Journal of Applied Sciences Research*, 3(9), 828–836.
- Toktarova, V. (2022). Model of Adaptive System for Mathematical Training of Students within eLearning Environment. *International Journal of Emerging Technologies in Learning*, 17(20), 99–117. <https://doi.org/10.3991/ijet.v17i20.32923>
- Tsybulsky, D. (2020). Digital curation for promoting personalized learning: A study of secondary-school science students’ learning experiences. *Journal of Research on Technology in Education*, 52(3), 429–440. <https://doi.org/10.1080/15391523.2020.1728447>
- Van Zwanenberg, N., Wilkinson, L. J., & Anderson, A. (2000a). Felder and silverman’s index of learning styles and honey and mumford’s learning styles questionnaire: How do they compare and do they predict academic performance? *Educational Psychology*, 20(3), 365–380. <https://doi.org/10.1080/713663743>
- Van Zwanenberg, N., Wilkinson, L. J., & Anderson, A. (2000b). Felder and silverman’s index of learning styles and honey and mumford’s learning styles questionnaire: How do they compare and do they predict academic performance? *Educational Psychology*, 20(3), 365–380. <https://doi.org/10.1080/713663743>
- Wahab, G., & Rosnawati. (2021). Teori-Teori Belajar Dan Pembelajaran. in *Paper Knowledge. Toward a Media History of Documents* (Vol. 3, Issue April).

- Wirayat, A., Junaidi, M., & Okianna. (2015). Pengaruh Kemandirian Belajar terhadap Hasil Belajar Siswa pada Mata Pelajaran Ekonomim di SMA. *Khatulistiwa Jurnal Pendidikan Dan Pembelajaran*, 4(4), 1–10.
- Yuwono, A. (2012). Profil Siswa SMA dalam Memecahkan Masalah Matematika Ditinjau dari Tipe Kepribadian. *Tesis*, 2012.
- Zagulova, D., Boltunova, V., Katalnikova, S., Prokofyeva, N., & Synytsya, K. (2019a). Personalized E-Learning: Relation Between Felder– Silverman Model and Academic Performance. *Applied Computer Systems*, 24(1), 25–31. <https://doi.org/10.2478/acss-2019-0004>
- Zagulova, D., Boltunova, V., Katalnikova, S., Prokofyeva, N., & Synytsya, K. (2019b). Personalized E-Learning: Relation Between Felder– Silverman Model and Academic Performance. *Applied Computer Systems*, 24(1), 25–31. <https://doi.org/10.2478/acss-2019-0004>