

## Table of Content

	<i>Page</i>
Approval Sheet.....	i
Biography.....	ii
Originality Statement.....	iii
Final Project Publication Approval Page For Academic Purpose.....	iv
Abstract.....	v
Preface.....	vi
Table of Content.....	viii
Table of Picture.....	x
List of Table.....	xi
Appendix List.....	xii
CHAPTER 1 PRELIMINARY.....	1
1.1 Background.....	1
1.2 Problem Identification.....	4
1.3 Scope of Research.....	4
1.4 Scope of Problem.....	5
1.5 Problem Formulation.....	5
1.6 Research Objectives.....	6
1.7. Benefits of Research.....	6
CHAPTER II THEORETICAL REVIEW.....	8
2.1 Development Research.....	8
2.2 4D Model Development.....	8
2.3 Student Worksheets.....	12
2.4 Electronic Student Worksheets.....	13
2.5 Literacy.....	14
2.6 Science Literacy.....	15
2.7 HOTS Science Literacy.....	15
2.8. Reading To Learn.....	17
2.7 Reaction Rate.....	20
2.8 Framework of Thinking.....	32
2.9 Research Hypothesis.....	34
CHAPTER III RESEARCH METODOLOGY.....	35

3.2 Types of Research .....	35
3.3. Subjects and Objects of Research .....	35
3.5. Research Design.....	36
3.6. Data Collection Techniques .....	37
3.7. Research Instruments .....	37
3.8. Research Procedures .....	41
3.9 Data Analysis .....	43
CHAPTER IV RESULTS AND DISCUSSION .....	52
4.1. Result of Research.....	52
4.2. Discussion .....	69
CHAPTER V CONCLUSION AND SUGGESTION .....	76
5.1. Conclusion .....	76
5.2 Suggestion.....	76
BIBLIOGRAPHY .....	78
APPENDIX.....	84



## Table of Picture

*Page*

<b>Figure 2.1</b>	The black balls represent 1.0 mmol of compound A, and the red balls represents 1.0 mmol of compound B. The boxes show the progress of the reaction $A \rightarrow B$ every 10 seconds for a 60-second interval (Horner et al., 2008).....	21
<b>Figure 2.2.</b>	As the reaction $A \rightarrow B$ proceeds, the number of molecules of A decreases, and the number of B molecules increases. This graph depicts the rate of a chemical reaction in a way that is easy to observe (Horner et al., 2008).....	22
<b>Figure 2.3.</b>	Only one of the possible $\text{NO}_{(g)}$ orientations and $\text{NO}_{3(g)}$ relative to each other which will result in the formation of $\text{NO}_{2(g)}$ products (Horner et al., 2008).....	24
<b>Figure 2.4.</b>	The area under the Maxwell-Boltzmann distribution curve describes the distribution of collision kinetic energy at a given temperature. At a given temperature, only a small portion of the molecules in a sample have sufficient kinetic energy to react (Horner et al., 2008).....	25
<b>Figure 2.5.</b>	As the concentration of reactant particles increases, the collision rate between the reactants also increases. Therefore, the reaction rate increases (Horner et al., 2008).....	26
<b>Figure 2.6.</b>	At higher temperatures, more particles are present. Collide with enough energy to react with each other. Therefore, increasing the temperature accelerates the rate of chemical reactions (Horner et al., 2008).....	27
<b>Figure 2.7.</b>	Catalysts cause the activation energy to be lower. For chemical reactions. Catalysts also increase the rate of reverse reactions (Horner et al., 2008).....	29
<b>Figure 2. 8.</b>	Zero-order reaction graph .....	30
<b>Figure 2. 9</b>	First-order reaction graph .....	31
<b>Figure 2. 10</b>	Second-order reaction graph .....	31
<b>Figure 2.11</b>	Framework of thinking.....	33
<b>Figure 3.1</b>	Research Design .....	37
<b>Figure 3.2.</b>	Development stage flow .....	42
<b>Figure 3.3.</b>	Research flow of distribution.....	43
<b>Figure 4.1.</b>	Home Signup Liveworksheets .....	55
<b>Figure 4.2.</b>	Create My Worksheet.....	56
<b>Figure 4.3.</b>	Add Worksheet.....	56
<b>Figure 4.4</b>	Fill Information of E-LKPD .....	57
<b>Figure 4.5.</b>	Add Elements and Save .....	58
<b>Figure 4. 6</b>	(a). Preparing for reading; (b). detailed reading; (c) note making; (d) joint construction .....	60
<b>Figure 4.7</b>	Graph of Students Response .....	62
<b>Figure 4. 8</b>	Graph of Pre-Test Results .....	65
<b>Figure 4.9.</b>	Graph of Post-Test Results.....	66

## List of Table

	<i>Page</i>
<b>Table 2.1.</b> Concentration A in Millimoles per Liter.....	21
<b>Table 3.1.</b> Validation Instrument Grid for Material Experts and Teachers.....	38
<b>Table 3.2.</b> Student Response Questionnaire.....	39
<b>Table 3.3.</b> Test Instrument Grid.....	40
<b>Table 3.4.</b> Reliability Coefficient Criteria.....	45
<b>Table 3.5.</b> Distinguishing Power Classification.....	46
<b>Table 3.6.</b> Level of difficulty classification.....	46
<b>Table 3.7.</b> Validity Criteria.....	47
<b>Table 3.8.</b> N-gain range criteria.....	49
<b>Table 3.9.</b> Effective Criteria.....	49
<b>Table 3.10.</b> Answer Choice.....	50
<b>Table 3.11.</b> Result of questionnaire category.....	50
<b>Table 4.1.</b> TP and ATP Reaction Rates Topic.....	53
<b>Table 4.2.</b> Link of E-LKPD.....	59
<b>Table 4.3.</b> Results of Material Validation by Lecturers and Teachers.....	61
<b>Table 4.4.</b> Results of Students Response.....	62
<b>Table 4.5.</b> Test Instrument Analysis Results.....	64
<b>Table 4.6.</b> Accumulation E-LKPD Results.....	66
<b>Table 4.7.</b> Normality of Pre-Test and Post-Test.....	67
<b>Table 4.8.</b> Homogeneity of Pre-Test and Post-Test.....	67
<b>Table 4.9.</b> Hypothesis Results.....	68
<b>Table 4.10.</b> N-Gain Test Result.....	69

UNIMED

THE  
*Character Building*  
UNIVERSITY

## Appendix List

Page

<b>Appendix 1.</b> ATP reaction rate .....	84
<b>Appendix 2.</b> Teacher Interview Result .....	85
<b>Appendix 3.</b> Need Analysis Result .....	87
<b>Appendix 4.</b> Instrument test .....	91
<b>Appendix 5.</b> Material expert validation sheet .....	104
<b>Appendix 6.</b> Teacher validation sheet .....	112
<b>Appendix 7.</b> Students' response questionnaire .....	118
<b>Appendix 8.</b> Rubric for expert validation .....	122
<b>Appendix 9.</b> Pre-Test and Post-test results .....	126
<b>Appendix 10.</b> E-LKPD results .....	127
<b>Appendix 11.</b> N-Gain Score Calculation .....	128
<b>Appendix 12.</b> SPSS calculation results .....	129
<b>Appendix 13.</b> Validity calculation from material experts .....	130
<b>Appendix 14.</b> Students respons answer .....	132
<b>Appendix 15.</b> Rubric for E-LKPD .....	133
<b>Appendix 16.</b> Test instrument calculation .....	139
<b>Appendix 17.</b> E-LKPD Results .....	146
<b>Appendix 18.</b> Research Permit Letter .....	157
<b>Appendix 19.</b> Research Completion Letter .....	158
<b>Appendix 20.</b> Observation Completion .....	159
<b>Appendix 21.</b> Instrumen Validation Completion .....	160
<b>Appendix 22.</b> PPT for Teaching and Learning Process .....	161
<b>Appendix 23.</b> Students Answer on E-LKPD .....	162
<b>Appendix 24.</b> Instrument Validation .....	169
<b>Appendix 25.</b> Instrument Test Validation .....	170
<b>Appendix 26.</b> Teaching Module Teaching Module .....	171
<b>Appendix 27.</b> Documentation .....	181

THE  
*Character Building*  
UNIVERSITY