

TABLE OF CONTENTS

APPROVAL SHEET	i
TABLE OF CONTENTS.....	ii
TABLE OF FIGURES.....	iv
LIST OF TABLES	v
APPENDIX LIST	vi
CHAPTER I INTRODUCTION.....	1
1.1 Background of the Problem.....	1
1.2 Problem Identification	5
1.3 Scope	5
1.4 Problem Limitation.....	5
1.5 Problem Formulation.....	6
1.6 Research Objectives	7
1.7 Benefits of Research.....	7
CHAPTER II LITERATURE REVIEW	9
2.1 Development	9
2.1.1 Research and Development	9
2.1.2 Development Research Models	10
2.2 Project Based Learning Model (PjBL).....	13
2.2.1 Definition of PjBL Model	13
2.2.2 Characteristic of PjBL Model	15
2.2.3 Syntax of PjBL Model	15
2.2.4 Assessment of PjBL Model	16
2.2.5 Advantages and Limitations of PjBL Model	18
2.3 Liveworksheet	19
2.4 Temperature and Heat	27
2.4.1 Temperature.....	27
2.4.2 Expansions (Thermal Expansion).....	31
2.4.3 Heat.....	39
2.5 Student Worksheet	44
2.5.1 Definition of Student Worksheet	44
2.5.2 Benefits and the advantage of Student Worksheet	44
2.5.3 Conditions for Making Student Worksheets	44
2.6 Learning Outcomes	45
2.6.1 Definition Learning Outcomes	45
2.6.2 Factors Affecting Learning Outcomes	46
2.7 Framework of Thinking.....	47
CHAPTER III RESEARCH METHOD	49
3.1 Location and Time of Research.....	49
3.1.1 Research Location.....	49
3.1.2 Research Time.....	49

3.2 Type of Research.....	49
3.3 Population and Sample.....	49
3.3.1 Population.....	49
3.3.2 Sample.....	50
3.4 Research Design and Variables.....	50
3.4.1 Research Design.....	50
3.4.2 Research Variables.....	50
3.5 Operational Definition.....	50
3.6 Data Collection Technique.....	51
3.7 Research Instrument.....	52
3.7.1 Expert validation questionnaire.....	53
3.7.2 Student Learning Outcome Test Instrument.....	58
3.8 Research Procedure.....	58
3.9 Data Analysis.....	62
CHAPTER IV RESULTS AND DISCUSSION.....	66
4.1 Research Results.....	66
4.1.1 Analysis Stage.....	66
4.1.2 Design Stage.....	68
4.1.3 Development Stage.....	73
4.1.4 Implementation Stage.....	78
4.1.5 Evaluation Stage.....	80
4.2 Discussion.....	80
4.2.1 Analysis Stage.....	80
4.2.2 Design Stage.....	82
4.2.3 Development Stage.....	83
4.2.4 Implementation Stage.....	84
4.2.5 Evaluation Stage.....	84
4.3 Researcher Limitations.....	85
CHAPTER V CLOSING.....	86
5.1 Conclusion.....	86
5.2 Suggestion.....	86
BIBLIOGRAPHY.....	88

TABLE OF FIGURES

	<i>Page</i>
Figure 2.1 Liveworksheets menu display	20
Figure 2.2 Register menu display	21
Figure 2.3 Fill in Liveworksheets account data	21
Figure 2.4 Response after register.....	21
Figure 2.5 Activate Liveworksheets account.....	22
Figure 2.6 Liveworksheets account is active	22
Figure 2.7 Login menu on Liveworksheets	22
Figure 2.8 Liveworksheets main menu	23
Figure 2.9 Liveworksheets creation menu	23
Figure 2.10 PDF file upload menu	23
Figure 2.11 Worksheet display after uploading	24
Figure 2.12 Editing menu display after worksheet is upload.....	24
Figure 2.13 Editing results successful.....	24
Figure 2.14 Worksheet data	25
Figure 2.15 Worksheet has been saved	25
Figure 2.16 My Worksheets.....	25
Figure 2.17 Student Worksheet has been saved in My worksheets	26
Figure 2.18 Menu for editing Worksheet.....	26
Figure 2.19 Editing sheet	27
Figure 2.20 Changes in shape in water	28
Figure 2.21 Analog thermometer and digital thermometer.....	31
Figure 2.22 Comparison of thermometer temperature scales	32
Figure 2.23 Thermal expansion joints on bridges.....	32
Figure 2.24 Long expansion in solids	34
Figure 2.25 Extensive expansion of solids.....	35
Figure 2.26 Bimetallic chip and expanded bimetallic chip.....	39
Figure 2.27 The process of changing the state of matter	39
Figure 3.1 Stages of ADDIE Model Development	59
Figure 3.2 Development steps in the ADDIE model	60
Figure 4.1 Cover of worksheet.....	70
Figure 4.2 Contents of worksheet	71

LIST OF TABLES

	<i>Page</i>
Table 2.1 The syntax of the PjBL model	15
Table 2.2 The types of thermometers	28
Table 2.3 Coefficients of linear expansion of some solids	33
Table 2.4 Specific heat of some substances	43
Table 3.1 Learning Tool Evaluation Criteria According to BNSP	53
Table 3.2 Questionnaire Grid for Material Expert	54
Table 3.3 Questionnaire Grid for Language and Learning Expert	55
Table 3.4 Questionnaire Grid for Design Expert	56
Table 3.5 Educator Response Questionnaire Grid	56
Table 3.6 Student Response Questionnaire Grid	57
Table 3.7 Student Learning Results Test Grid	58
Table 3.8 Expert Validation Questionnaire Likert Scale	62
Table 3.9 The Expert Questionnaire Criteria	63
Table 3.10 Likert Scale of Educator and Student Responses	64
Table 3.11 Educator and Student Responses Criteria	65
Table 3.12 N-Gain Value Categories	65
Table 4.1 Results of the Analysis of Students' Needs	66
Table 4.2 Results of the Analysis of Students' Characteristics	67
Table 4.3 Results of the Analysis of Educators' Needs	68
Table 4.4 Material Expert Revision Results	73
Table 4.5 Material Expert Validation Results	74
Table 4.6 Language and Learning Expert Revision Results	75
Table 4.7 Language and Learning Expert Validation Results	75
Table 4.8 Design Expert Revision Results	77
Table 4.9 Design Expert Validation Results	77
Table 4.10 Results of Student Responses	78
Table 4.11 Results of Science Teacher	79
Table 4.12 Results of Pre-Test and Post-Test	80
Table 4.13 Calculation Results of N-Gain	80

APPENDIX LIST

	<i>Page</i>
Appendix 1 Teaching Modul	96
Appendix 2 Grid of Learning Outcomes Test Questions.....	106
Appendix 3 Learning Outcomes Test Questions	111
Appendix 4 Assessment Rubric	117
Appendix 5 Student Worksheet	121
Appendix 6 Results of Analysis of Students' Needs Sheet	133
Appendix 7 Results of Analysis of Students' Characteristics Sheet.....	134
Appendix 8 Results of Analysis of Educator Needs Sheet	135
Appendix 9 Results of Material Expert Validation Sheet.....	137
Appendix 10 Results of Language and Learning Expert Validation Sheet	140
Appendix 11 Results of Design Expert Validation Sheet	143
Appendix 12 Results of Student Responses Sheet.....	146
Appendix 13 Student Responses Answer Sheet	148
Appendix 14 Results of Educator Responses Sheet	150
Appendix 15 Results of Pre-Test and Post-Test Students.....	152
Appendix 16 Pre-Test and Post-Test Students Answer Sheet	153
Appendix 17 N-Gain Calculation Results for students of class VII-5	158
Appendix 18 Documentation of Research	159

THE Character Building
UNIVERSITY