

## LIST OF CONTENTS

APPROVAL SHEET.....	i
DECLARATION.....	ii
ABSTRACT.....	iii
PREFACE.....	v
ACKNOWLEDGMENT.....	vi
LIST OF CONTENTS.....	viii
LIST OF TABLE.....	xi
LIST OF FIGURES.....	xii
LIST OF APPENDIX.....	xiv
CHAPTER I INTRODUCTION.....	1
1.1 Background.....	1
1.2 Research Problem.....	3
1.3 Research Question.....	3
1.4 Limitation of Problem.....	3
1.5 Research Objective.....	4
1.6 Research Benefits.....	5

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

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

1.7	Organization of Research Paper .....	5
CHAPTER II LITERATURE REVIEW .....		7
2.1	Mobile Learning .....	7
2.2	Arduino-Photoboard Projects .....	9
2.3	Content Analysis on Electricity .....	14
2.4	Relevant Research .....	24
CHAPTER III RESEARCH METHODOLOGY .....		26
3.1	Research Method .....	26
3.2	Research Design .....	26
3.3	Population and Sample .....	26
3.4	Operational Definition.....	27
3.5	Research Instrument .....	28
3.6	Instrument Validation.....	29
3.7	Data Collection.....	29
3.8	Data Analysis Technique.....	30
3.9	Research Procedure .....	31
CHAPTER IV RESULT AND DISCUSSION .....		33

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

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

4.1	Analysis Stage .....	33
4.2	Design Stage.....	36
4.3	Development Stage.....	37
4.4	Implementation Stage.....	52
CHAPTER V CONCLUSION AND RECOMMENDATION .....		63
5.1	Conclusion.....	63
5.2	Recommendation.....	63
REFERENCES .....		65
APPENDIX .....		69
AUTOBIOGRAPHY .....		186

## LIST OF TABLES

Table 2.1	Cambridge IGCSE Dynamic Electricity Content.....	15
Table 2.2	Indonesian Curriculum 2013 Electricity Content .....	18
Table 3.1	Likert Scale for Experts' Judgment Rubric .....	32
Table 3.2	Percentage Range and Descriptive Criteria of Program .....	32
Table 4.1	Hardware Necessity Specification .....	35
Table 4.2	Experts' Judgment Result on Content .....	40
Table 4.3	Content Revision .....	41
Table 4.4	Experts' Judgment Result on Language .....	44
Table 4.5	Language Revision .....	45
Table 4.6	Experts' Judgment Result on Media (IT).....	48
Table 4.7	Media (IT) Revision .....	49
Table 4.8	Result of Science Teachers' Questionnaire on Mobile Learning .....	53
Table 4.9	Result of Junior High School Students' Questionnaire on Mobile Learning Application .....	57

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

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

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON  
ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

Universitas Pendidikan Indonesia | [repository.upi.edu](https://repository.upi.edu) |  
[perpustakaan.upi.edu](https://perpustakaan.upi.edu)

## LIST OF FIGURES

Figure 2.1	Arduino Uno .....	10
Figure 2.2	Arduino IDE Software (1.6.7 version) .....	10
Figure 2.3	The Breadboard .....	12
Figure 2.4	The Assembly of Components .....	13
Figure 2.5	The Way to Connect All the Components .....	13
Figure 2.6	The Arrangement of All Parts of the Project .....	14
Figure 2.7	The Resistors and its Electrical Symbol .....	21
Figure 2.8	The Component of Diode .....	21
Figure 2.9	The Symbol of Circuits .....	22
Figure 2.10	The Flow of Current .....	23
Figure 2.11	The Flow of Current .....	24
Figure 3.1	Research Plot.....	32
Figure 4.1	The Appearance of Android Studio and its Code for Making the Application.....	35
Figure 4.2	The Example of a Storyboard Scheme .....	37
Figure 4.3	The Interface of Mobile Learning Application based on Arduino Projects which are called Mhan Academy .....	38
Figure 4.4	The Interface of Mobile Learning Application based on Arduino Projects which are called Mhan Academy (2) ..	39

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

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

Figure 4.5	The Interval Result of Experts' Judgment on Content ....	42
Figure 4.6	The Interval Result of Experts' Judgment on Language .	45
Figure 4.7	The Interval Result of Experts' Judgment on Media .....	50
Figure 4.8	The Result of Science Teacher Questionnaire .....	54
Figure 4.9	The Distribution of Students from each Grade .....	56
Figure 4.10	Result of Junior High School Students' Questionnaire ..	59
Figure 4.11	The Percentage of Students' Answer on Traffic Light Project's Quiz .....	60

## LIST OF APPENDIX

A. INSTRUMENT DEVELOPMENT TOOLS .....	69
Appendix A.1 Flowchart .....	70
Appendix A.2 Storyboard .....	72
Appendix A.3 Content Analysis .....	78
Appendix A.4 Quiz Analysis .....	84
Appendix A.5 Interface .....	92
B. EXPERTS' JUDGMENT RESULTS .....	123
Appendix B.1 Result of Expert Judgment on Content .....	123
Appendix B.2 Result of Expert Judgment on Language .....	139
Appendix B.3 Result of Expert Judgment on Media .....	149
C. QUESTIONNAIRE OF TEACHER AND STUDENTS' RESULTS .....	165
Appendix C.1 Science Teachers' Questionnaire .....	165
Appendix C.2 Students' Questionnaire .....	176

**Darul Agustiana Ma'rifah, 2018**

*THE DEVELOPMENT OF ANDROID MOBILE LEARNING APPLICATION BASED ON ARDUINO PROJECTS FOR JUNIOR HIGH SCHOOL STUDENTS*

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



D. DOCUMENTATION .....	181
Appendix D Photo Documentation .....	182
E. RESEARCH PERMISSION LETTER .....	183
Appendix E Research Permission Letter .....	184