

Design Document

Chia-Sheng Chien

California State University, San Bernardino

## Design Document

### Instructional Objectives

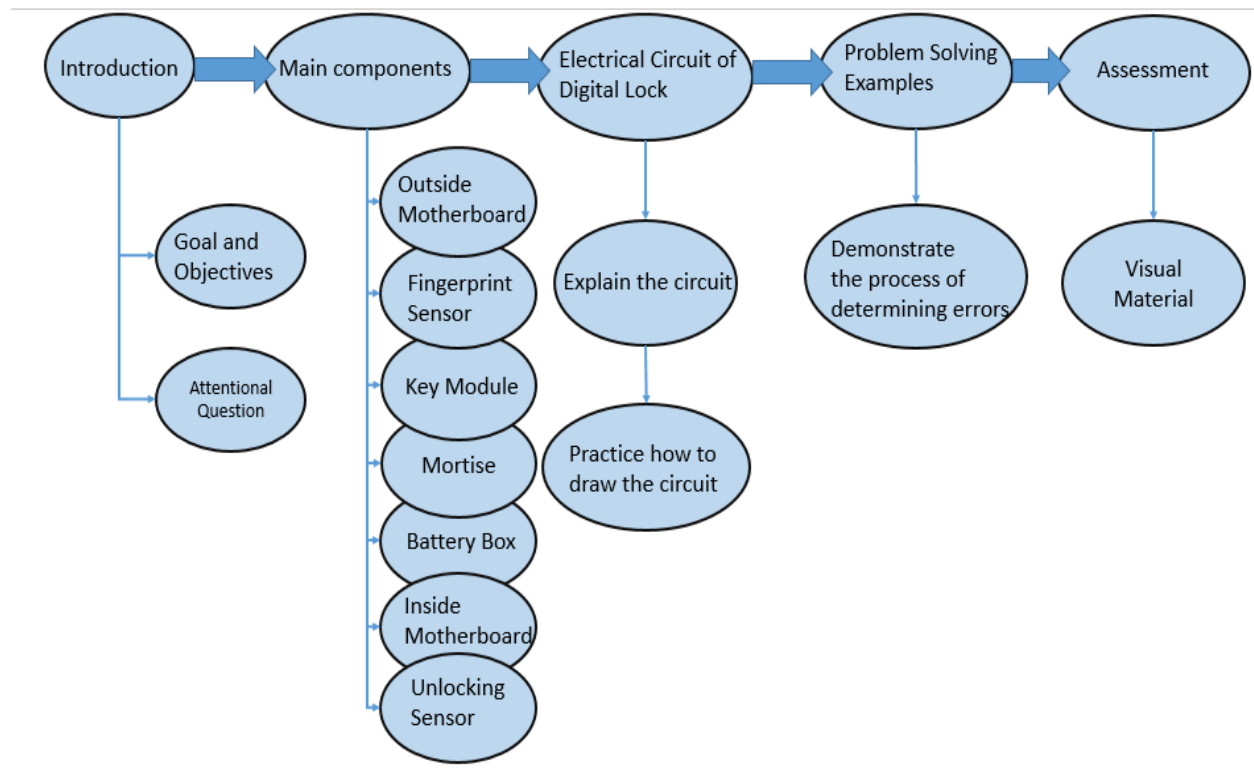
In this project, the goal for new engineers is to determine the malfunctions on Samsung digital door lock by applying electrical circuit, so the learning objectives are based on circuit concept. According to Birgili (2015), “building new knowledge onto the previous one in order to solve the problem.” Basically, Birgili is saying to resolve authentic problems, people must to apply the theories or methods that they have learned. Furthermore, electrical circuit is basic concept in engineering field, and it also can be applied in every electrical device. Thus, new engineers can use their prior circuit learning to connect with Samsung digital door lock in order to build their problem solving skills for servicing clients in the company. Hence, the objectives are divided in three parts, main components, the functions of circuit, and determining malfunctions on the circuit. First, learners have to know the main components which Samsung digital door lock is consisted, and enable to explain the feature of each component. Second, using the main components to make a big picture of electrical circuit in order to describe the lock’s functions. Third, based on the circuit, several problem examples are provided to learners for evaluating the errors. Consequently, the instructional objectives of this project are:

1. Given 7 main components of Samsung digital door lock, learners are able to explain all of it.
2. Provided electrical circuit of digital door lock, learners are able to describe the process of locking and unlocking functions.
3. Given customers' problems, learners are able to identify errors without any assistance.

### Instructional Content Structure

The contents are presented through website which has clear categories for learners to navigate easily. Totally, there will be five sections on the website. Specifically, the first section will be homepage which will show a short introduction, goal, and learning objectives; additionally, since to “capture students' attention is to start each lesson with a thought-provoking

question,” (Kruse, 2009) questions which can guide learners to this learning will be shown on homepage too. Then, the main contents will be organized in the following three sections by the learning objectives. According to Merrill (2002), “learning is promoted when new knowledge is demonstrated to the learner.” Thus, the introductions of main components, electrical circuit, and problem solving methods will be explained in these three sections; also, several practices will be included in order to assist learners to enhance their understandings. Finally, the last section is to evaluate how the learners’ knowledge on this project. Learners will see an URL that links to online questionnaire, and there will be 5 opened-ended questions which are regarded to the contents. Besides, based on the new engineers’ responds in analysis report, they prefer to have visual material for helping them during their works. Thus, a rapid way of determine malfunctions will be sort out as a PDF file which will be put on last page for downloaded. Below is the flowchart:



## Motivation Strategy

Dick and Carey's five phases of instructional strategy will be utilized. Here are the five phases and descriptions of how each phase be applied in this project:

1. *Sequence and cluster objectives:*

The sequence of three learning objectives in this project is to learn main components at first, then connect the components by electrical circuit, finally, use electrical circuit to determine malfunctions. Also, each objective has a specific section for clarifying the contents.

2. *Plan pre instructional, assessment, and follow-through activities:*

Pre instructional: On the homepage, thought-provoking questions will be used for motivating learners; specifically, telling learners that this materials can promote their job performances.

Assessment: After reading this learning material, an online survey will be provided on last page of website. In order to simulate authentic problems from clients, all the questions will be opened-ended questions.

Follow-through activities: This website can be accessed anytime easily, so learners can come back and review the contents when they need. Also, there is a visual aid material will be put on the site, and it will be helpful for learners during their works.

3. *Plan the content presentations for each objective:*

The first objective is to introduce the feature of each main component. Then, before the second objective, learners' prior knowledge which is circuit concept have to be recalled, and circuit to understand the functions of digital door lock. Finally, providing real-world cases to learners for practicing problem solving skills.

4. *Assign objectives to lessons:*

In each section, one or two tasks will need to be done. For example, list all the main components, draw the electrical circuit of the functions, and infer the errors.

5. *Select a delivery system:*

Website will be an appropriate delivery system for this project. Learners are able to use computers or smartphones to review the contents, and they can also link the website at home. Hence, the learning time becomes flexible. Additionally, learners can download visual material which is PDF file in smartphones to assist their works even if Internet is disconnected.

### **Media Selection**

Electrical circuit is the main tool in this learning, so the media will be focused on how to present circuit concept on the site. Since electrical circuit is an abstract item, image is a clear selection to show it. Moreover, according to website, *Glenda's Assistive Technology Information and More*, “images connect directly to long-term memory.” Hence, using images will be an effective way to present Samsung digital door lock.

### **Practice Activities with Feedback**

In each objective section, the contents will include practices for enhancing learners’ understanding. Furthermore, Khan et al. (2010) state, “PBL provides a format for the students to share information and work productively with others.” Thus, learners are allowed to share their practices with peers in order to obtain useful improvement. Here are the activities for three learning objectives:

1. Explain the main components:

Learners will be asked to memorize every component, and describe the primary feature of each component. However, this part is requesting learners to remember the descriptions, so learners can practice by themselves until they are able to memorize all components without any feedback.

2. Describe the electrical circuit of door lock functions:

Learners will be asked to redraw the electrical circuit without any assistance. Yet, electrical circuit can be designed flexibly, so it may be drawn in different types. As a result, learners will need suggestions or feedback for circuit that they practice, so learners are allowed to send their practices to senior engineers and get the feedback by social media.

3. Identify malfunctions of example cases:

Several real cases will be provided to learners, and request them to solve the issues.

Different people may determine different solutions on the same case. Therefore, learners should use their critical thinking skills to discuss with peers or senior engineers in order to obtain multiple ideas on identifying errors.

### **Testing, Evaluation Strategy, and Grading Rubrics**

Five opened-ended questions need to be answered at the end. The questions are picked up from repair records which were provided from the director of the department. Further, after analyzing the repair records, five cases which are selected for assessment are defined as the most frequent problems from customers. Also, the records mention the common malfunctions and solutions in the past. However, there is no score for this test; learners should answer every possible solutions since these are authentic problems. Of course, the answers do not have to be one hundred percent correct, but at least the most important part must be answered. Further, all

responds will be reviewed by the director, senior engineers, and instructional designer to evaluate the problem solving skill of Samsung digital door lock on new engineers. Below are the questions and answers:

1. If a digital lock is totally dead, which components should be investigated?

Answer: Battery box and **inside motherboard**.

2. If a digital lock cannot lock on automatically, which components may be broken?

Answer: **Mortise**, **inside motherboard**, and unlocking sensor.

3. If a digital lock cannot be unlocked by password, which components may be broken?

Answer: Outside motherboard, **inside motherboard**, and **mortise**.

4. If a digital lock cannot be unlocked by fingerprints, which components may be broken?

Answer: Fingerprint sensor, **inside motherboard**, and **mortise**.

5. Suppose a digital lock has multiple errors, but you have to solve this case quickly. Which component that you can replace it first in order to determine further malfunctions?

Answer: **Inside motherboard**.

Since the red texts of answers are the importance for each question, learners must be able to respond it. Therefore, the red texts are the criteria for instructional designer to determine how learners absorb.

### A Timeline for Development

Date	Task
May 4~8	Finish first version of design report and storyboard
May 9~10	Revise design report and storyboard
May 10~16	Work on development report and design prototype of the project
May 17~19	Revise development report and the prototype
May 20~21	Recruit 2 audiences who have engineering background to do beta test
May 22~23	Revise the prototype from the feedback of the beta test
May 24~31	Finalize the design and send it to target audiences
June 1~4	Revise the design and work on evaluation report

## References

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