

# Lego Spike Prime Project

*by* Naod Habtom

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# **LEGO SPIKE PRIME PROJECT**

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**Integrating Project (Computing Foundation Year version)**



**MAY 2, 2024**  
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## Introduction

In the paced world we live in today achieving success, in both professional aspects often require more than just technical know-how. It also involves having a set of skills that can be applied across areas. These skills, like problem solving, communication, teamwork, flexibility, and leadership are highly valuable in fields. Are crucial for navigating the complexities of modern life and work.



This project aims to offer participants opportunities to develop and improve these skills through engaging challenges and activities. By participating in hands on tasks and reflective exercises participants will not enhance their proficiency, in specific skill areas but also learn how to effectively utilize them in real life situations.

The project aims to provide a hand, on and experiential learning experience allowing participants to take part in a series of challenges and activities. These tasks are designed to enhance skills that can be applied in situations fostering connections across different areas of study and promoting well rounded skill development.

Participants will have the opportunity to work both independently and collaboratively in teams engaging in challenges that require thinking, effective communication, teamwork, and adaptability to scenarios. After each activity there will be a session for reflection where participants can evaluate their performance recognize their strengths and weaknesses and set goals, for improvement.

## Background

To create a project focused on a LEGO SPIKE Prime robot addressing issues and developing skills we need to explore relevant literature for valuable guidance. Here's the plan, for organizing our research.

### 1, LEGO Education and STEM Learning:

Reviewing research on incorporating LEGO robotics platforms in schools, specifically SPIKE Prime.

Examining how the use of LEGO robotics contributes to improving learning outcomes in STEM fields.

Discovering strategies and teaching methods, for integrating LEGO robotics into school curricula to foster skill growth.

### 2, Problem-Solving and Programming Skills:

When it comes to tackling challenges, problem solving involves recognizing an issue examining it thoroughly and devising the solution to resolve it. Software developers rely on this method as a part of their tasks. It may involve troubleshooting why a

code segment isn't functioning correctly or creating the structure, for a software platform. [1]

### 3, Collaborative Learning and Teamwork:

Collaborative learning involves students working together in groups to improve their learning experience. In this approach two or more learners come together to solve problems, accomplish tasks, and acquire knowledge and skills. [2]

Examine studies, on teamwork through LEGO robotics emphasizing the benefits of group tasks in enhancing teamwork, communication, and leadership qualities.

Investigate published works on methods to foster collaboration and communication within teams working on robotics projects.

Discover techniques, for organizing group activities and delegating responsibilities to optimize learning results and boost the skills growth of participants.

### Project plan

#### 1. Getting Started Introduction (Week 1):

Introduce everyone to the project goals emphasizing the importance of developing skills that can be applied in situations.

Give an overview of the LEGO SPIKE Prime robotics. What it can do.

Engage, in team building exercises to encourage teamwork and establish group dynamics.

#### 2. Background Research (Week 2):

Assign tasks for researching transferable skills development LEGO robotics education and problem-solving approaches. 

Lead group discussions to share discoveries and insights from the research.

Help participants identify concepts and methods that will guide the projects design.

#### 3. Identifying Skills (Week 3):

Conduct a workshop to collectively pinpoint and prioritize skills for the project.

Utilize a skills matrix or a similar tool to link these skills with project tasks and learning goals.

Encourage participants to think about our strengths and areas where we can improve in relation to these identified skills.

#### **4. Designing and Planning (Week 4):**

Work together on structuring the project including deciding on problem solving challenges that will be addressed using LEGO SPIKE Prime robots.

Divide the project into tasks and assign roles, to team members. Create a schedule. Set goals, for carrying out the project considering factors like the availability of resources and the schedules of participants.

#### **5. Skill Identification (Week 5):**

Host workshops to introduce participants to the LEGO SPIKE Prime. Software.

Lead participants through activities aimed at enhancing our skills in programming, integrating sensors, and designing components.

Offer opportunities for trial and error as participants work on creating prototype solutions to project challenges.

#### **6. Implementation and Iteration (Weeks 6-7):**

participants as we put our robot solutions into action to tackle the specified issues.

Conduct check ins and reviews to evaluate project progress and pinpoint areas for enhancement.

Encourage participants to refine our designs and approaches based on feedback and insights gained from testing.

#### **7. Presentation and Review (Week 8):**

Prepare participants, for presenting our robot solutions and showcasing the proficiency in skills.

Arrange a presentation session where each team displays our project results emphasizing the skills acquired and lessons learned.

Facilitate a conversation to help participants solidify our learning outcomes and set objectives for skill advancement.

#### **8. Feedback and Assessment (Week 9):**

Gather thoughts, from participants regarding their project experience highlighting what went well areas for improvement and any suggestions we may have.

Assess how the project outcomes align with the intended learning objectives and success measures that were set beforehand.

Utilize feedback from participants and evaluation data to guide iterations of the project and pinpoint areas that could be enhanced.

Through this project roadmap our goal is to craft a structured and interactive learning journey that does not impart technical expertise in robotics to participants but also nurtures the development of valuable skills applicable both, in personal life and professional settings.

## Design Process

### Designing the Maze:

1. Decide on the size and shape of the maze. Choose materials, like cardboard boxes or wooden planks for constructing the walls.
2. Sketch a layout on paper considering pathways ends, optional shortcuts and loops we want to incorporate.
3. Use tape or chalk to mark out the pathways on the floor based on our design to guide wall construction.

### Building the Maze:

1. Build maze walls with our materials according to our design ensuring it is tall enough to block visibility.
2. Enhance the maze by adding elements such as doorways, arches, windows, ramps, bridges, or platforms, for added complexity.
3. Test the maze after construction to ensure it offers a solvable experience; adjust layout or pathways as needed for a level of difficulty.

### Using the Maze:

1. Establish Rules; Before we go into the maze explain any rules or instructions people must follow. This could include no running, no peeking, over walls or a time limit to finish the maze.
2. Provide Lighting; Depending on where the maze's situated might need to add lighting to help with navigation. Think about using battery powered lights or lanterns to brighten up areas.
3. Give Incentives; To enhance the experience think about offering prizes or rewards for those who successfully navigate the maze within a time frame or discover checkpoints along the path.

## Evaluation and result

### 1. Following the Guidance Line with an Obstacle:

#### Evaluation



**Problem Solving:** Assessing how well participants can manoeuvre our robot around the obstacle while following the guidance line. Look for signs of thinking and adaptability, in adjusting their robot path to avoid the obstacle.

**Critical Thinking:** Evaluating participants ability to analyse the problem identify solutions. Make informed decisions on how to guide their robot around the obstacle without straying from the guidance line.

**Spatial Reasoning:** Gauging participants spatial reasoning abilities as they guide the robot along the guidance line considering factors such as distance, direction and the interplay, between the robot position and the obstacle.

#### Result

The individuals were able to guide the robot past the obstacle showcasing our ability to solve problems efficiently and think critically. Certain participants might face difficulties in figuring out the route, around the obstacle suggesting opportunities for improvement, in reasoning and strategic decision making.

### 2. Navigating the Physical 3D Maze:

#### Evaluation

Evaluating how well participants grasp and move through the maze using the robot assessing their reasoning by observing the ability to identify patterns understand the maze layout. Plan efficient routes.

Assessing participants problem solving capabilities as we encounter obstacles and dead ends in the maze. Evaluating our skills in analysing the maze layout developing strategies, for navigation. Adjusting their approach when necessary.

Measuring participants. Innovation, in developing strategies or solutions for navigating the maze. Looking for signs of approaches, alternative paths or inventive use of robot sensors and programming methods.

#### Result

Players skilfully guide our robots through the maze showcasing our awareness problem solving abilities and creativity.

Certain players might face challenges, in devising solutions for maze layouts suggesting opportunities, for enhancing spatial reasoning and strategic thinking.

By assessing participants' performance in these scenarios, we can gain insights into our cognitive and intellectual skills related to problem-solving, critical thinking, spatial reasoning, and creativity. The results of the evaluation can inform future training or educational activities aimed at strengthening these skills.

### References

[1] (July 24,). *What Is Problem Solving?*. Availab [ps://www.hackerrank.com/blog/what-is-problem-solving-introduction/](https://www.hackerrank.com/blog/what-is-problem-solving-introduction/).

[2] (April 5). *Collaborative learning*.  
Available: <https://www.valamis.com/hub/collaborative-learning>.

# Lego Spike Prime Project

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## GRADEMARK REPORT

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FINAL GRADE

40/100

GENERAL COMMENTS

Hi Naod,

You had a good start with a nice introduction to robotics. However, in most sections, only generic details have been provided, and details specific to the assessment specification are missing.

Adding code blocks and images of your robot design would have added significant value.

You did a good job evaluating the expected tasks in each stage of your project. It would be helpful to hear more about the specific challenges you faced and how you overcame them.

- Additionally, explaining where sensors and motors are placed would help us better understand your robot design.

Introduction-12

Research skills- 9

Plan- 8

stage wise success- 8

Reflection- 3

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PAGE 1

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PAGE 2

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PAGE 3

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### Comment 1

A good start

PAGE 4

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### Comment 2

It's a good attempt to give the project plan however could have explained in detail about the tasks that need to be completed



### Comment 3

need to be more specific

PAGE 5

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PAGE 6

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### Comment 4

but the design process should mention about the components used in robot design, and the algorithm behind the robot following the line and enetring the maze etc.,

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### Comment 5

screenshots of coding and design should be included

PAGE 8

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### Comment 6

If references are used IEEE referencing style should be adhered

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