

## RESEARCH ARTICLE

# Experimental commands development for LEGO WeDo 2.0 in Python language for STEAM robotics advanced classes

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**Abstract:** In STEAM education, Lego WeDo 2.0 robot kit is a well-known tool for introducing educational robotics in elementary schools. This kit teaches students the skills necessary for future success. It provides a wide array of educational opportunities across subjects, along with lessons and other digital resources. This article presents experimental commands/functions development in Python programming language through a Raspberry Pi, permitting a suitable connection to the Lego WeDo 2.0 robot based on Scratch WeDo 2.0 commands for STEAM robotics learning in advanced classes. The main reasons for developing the commands are that Scratch language is a novice programming, and students gain incorrect perceptions of programming behaviour. In contrast, Python is real-world programming, in which students can utilise the language in future careers, and students can also create dynamic programs in Python using WeDo 2.0. Additionally, in this study, some projects are presented using the constructed Python functions developed by us versus the same programs in Scratch as examples for activities in the STEAM classrooms using Lego WeDo 2.0 Robot Kit. The limitation of this study was the lack of testing functions in actual instructive practice for data collection about the effectiveness of Python WeDo 2.0 commands in the classroom. The contribution of this study lies in the novelty framework of the development of WeDo 2.0 Python functions, which can be utilised in STEAM robotics advanced classrooms for learning in the fields of science, technology, engineering, the arts and mathematics.

**Keywords:** STEAM, educational robotics, Scratch, Python, WeDo 2.0, Raspberry Pi

## 1 Introduction

Traditional programming methods do not solve students' problems, resulting in negative attitudes towards programming (Owen-Hill, 2021). STEAM education solves the problems created by conventional teaching approaches as it is an effective tool, and it contributes forward cultivating and developing cognitive structures by students (Yakman, 2008). STEAM is an approach to learning that employs Science, Technology, Engineering, the Arts, and Mathematics to direct pupil inquiry, dialogue, and critical thinking (Korkmaz, 2016). "Scratch MIT" is a visual programming language that allows children to effectively create interactive content (Korkmaz, 2016; Papadakis ET AL., 2016). "Python" is a "real" programming language with valuable data structures as a core part of the language; it gives them prominent names and makes them extraordinarily easy to use (Vega, 2018; Verawati et al., 2022). Such usefulness, simplicity, and clarity remove barriers to programming, making the transition from Scratch language smoother (Ladias et al., 2021; 2022). The development set WeDo 2.0 permits pupils to construct and program basic LEGO models connected to a computer and can execute essential robotic assignments. This practice contains two stages, software, and hardware, which encourage the introduction of educational robotics into the classroom (Chalmers, 2018; Olabe et al., 2011; Papadakis, 2020). Programming can be too difficult and tedious when learned through the conventional "abstract" method (Kapaniaris & Zampetoglou, 2021). On the contrary, pupils learn what robots can and cannot do with direct experience and understanding by handling a physical robot and noticing its situation (Lazarinis et al., 2022). By programming robots, pupils can discover if their aptitudes and interests correspond to those skills that will define the future job market, like programming, science, technology, or engineering (Kalovrektis et al., 2021; Tzagkaraki et al., 2021).

This research presents the transition from Scratch to Python programming using the LEGO WeDo 2.0 robot kit by implementing python commands/functions. Notably, some commands were designed and implemented based on Scratch MIT and Python using the LEGO WeDo 2.0 robot kit for advanced pupils to shift from Scratch to Python programming. The main objective of the research was to have Lego WeDo 2.0 operates with Python compared to Scratch for robotics learning.























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