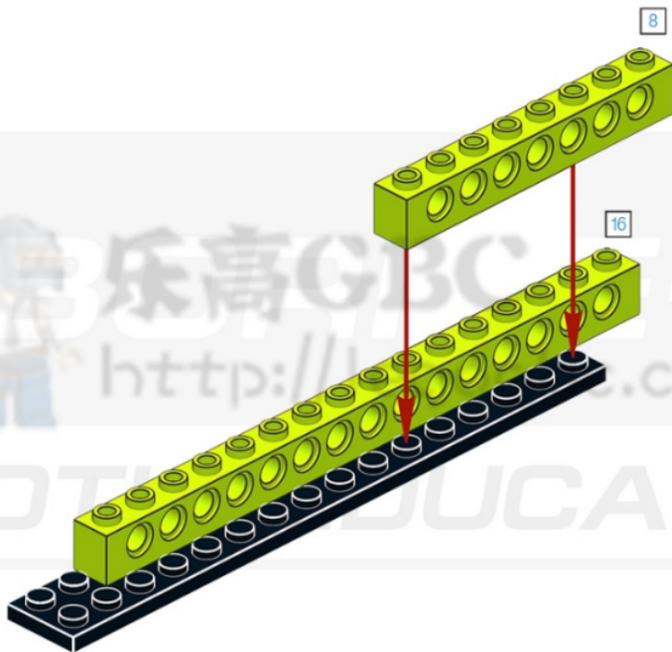
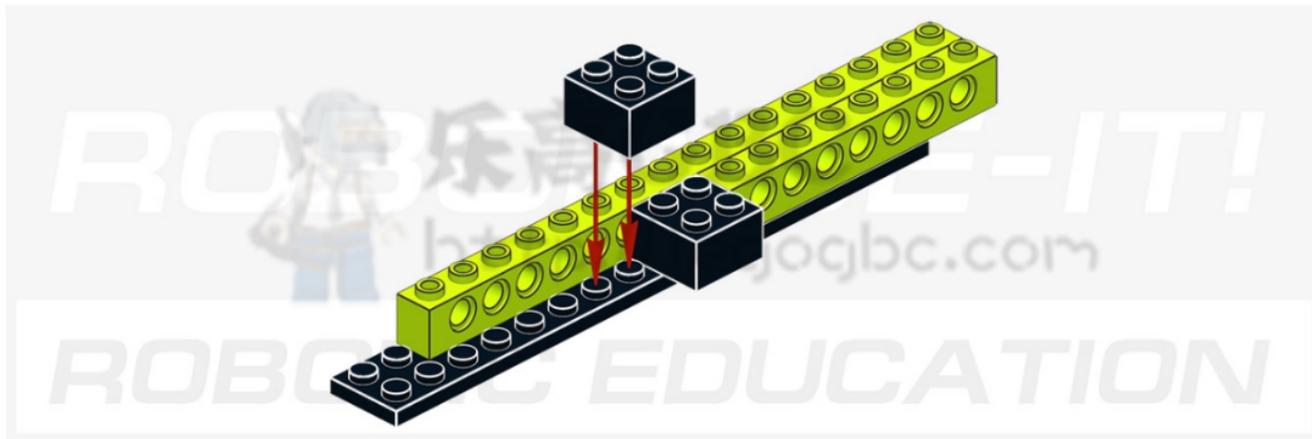


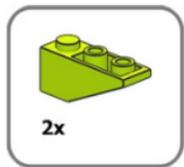
1



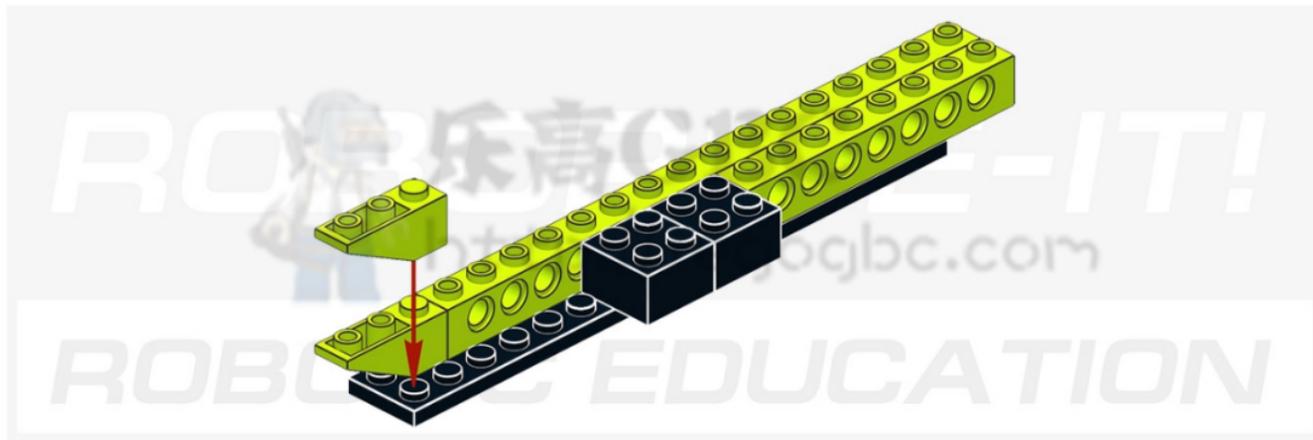


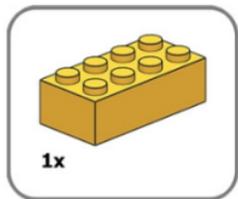
2



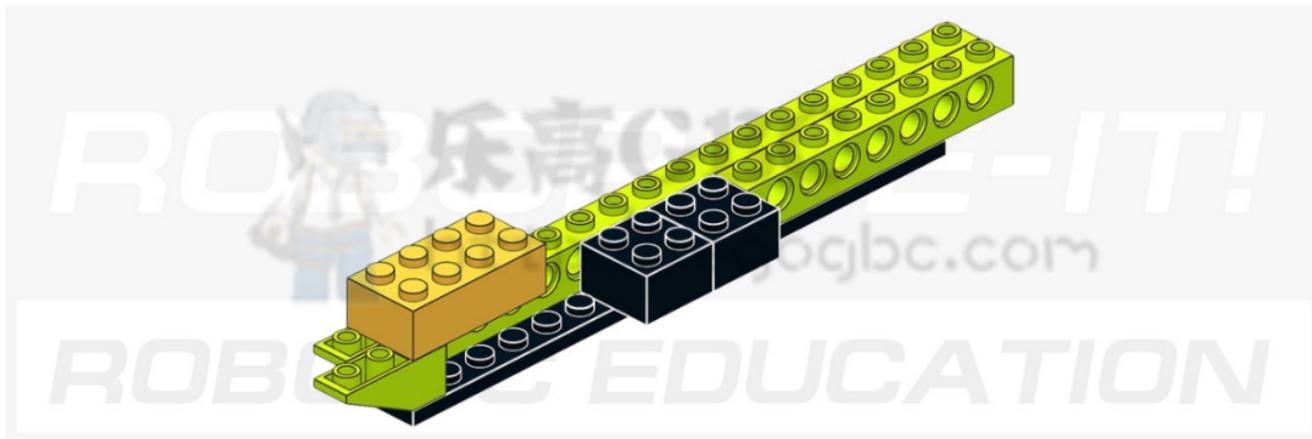


3



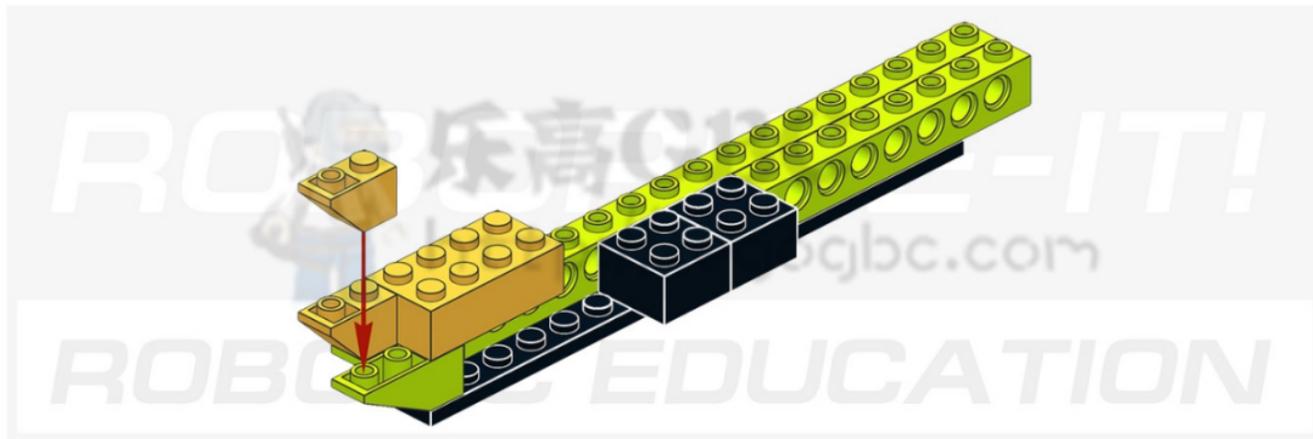


4

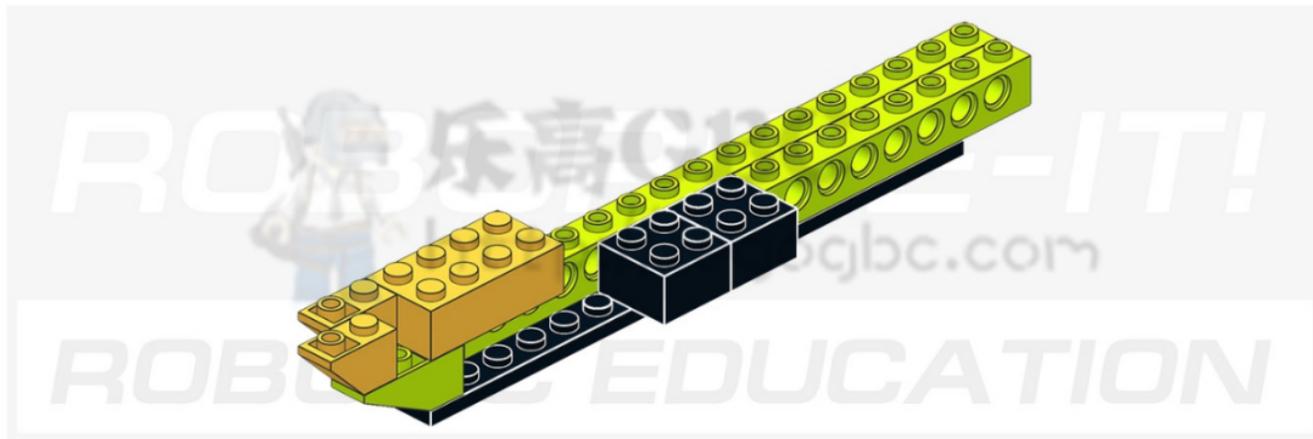


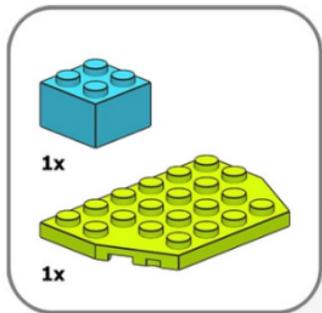


5

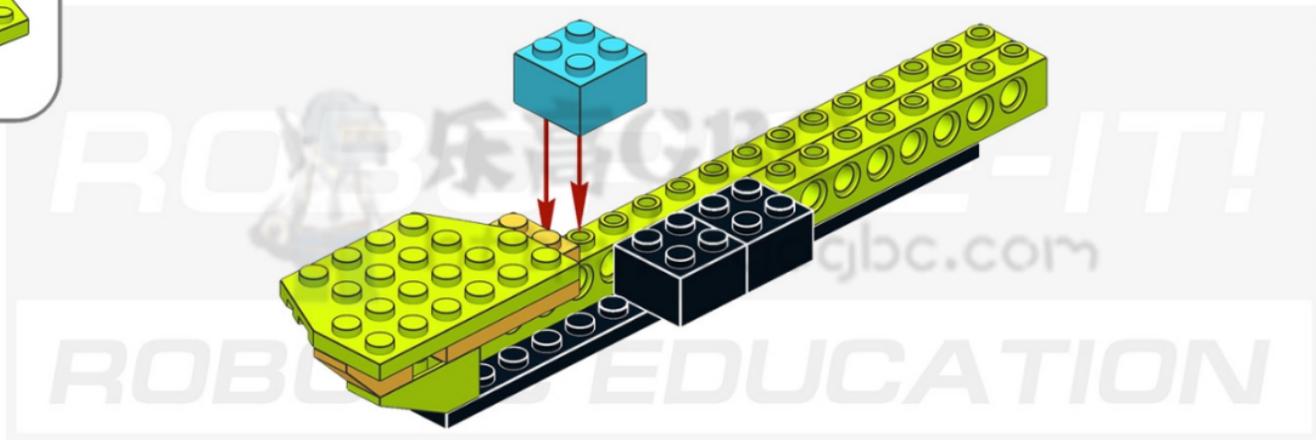


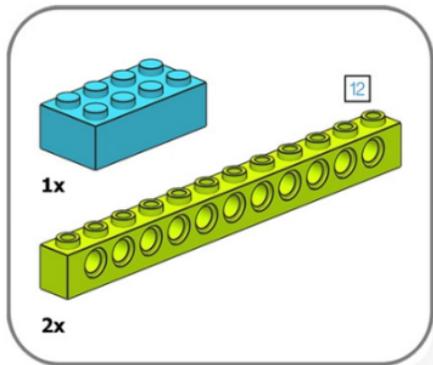
6



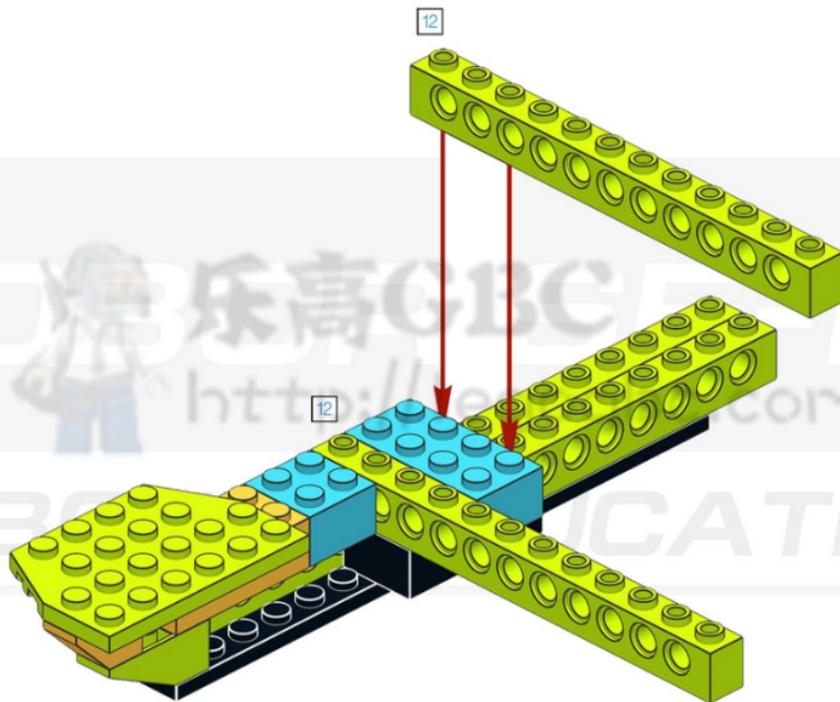


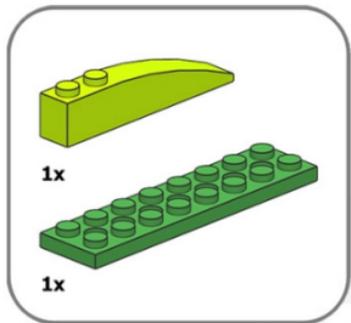
7



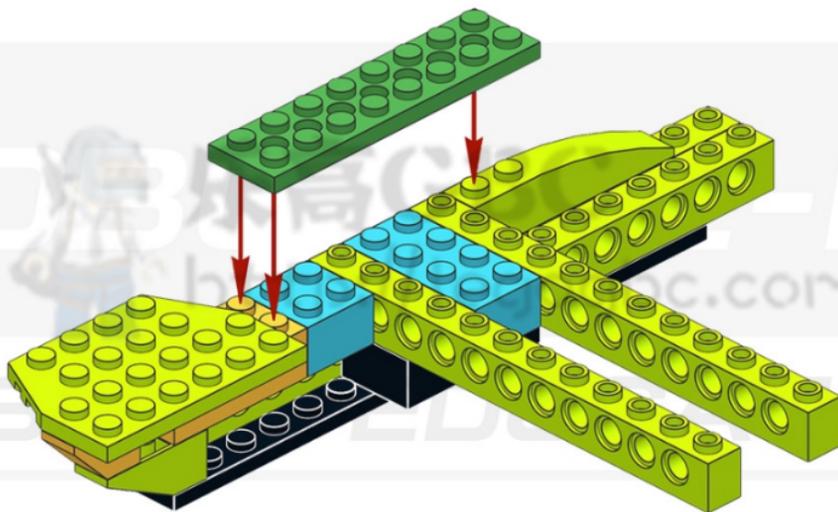


8

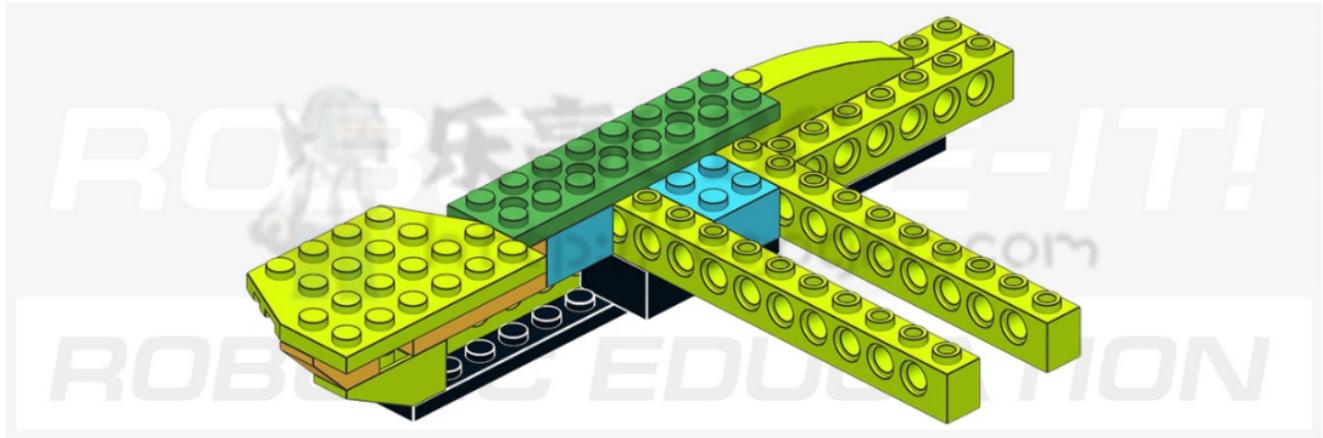


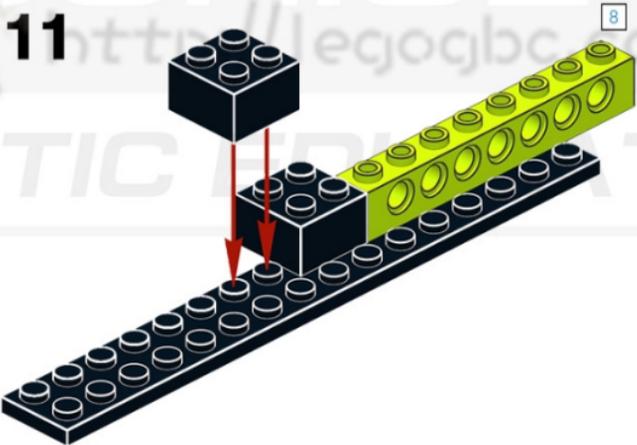
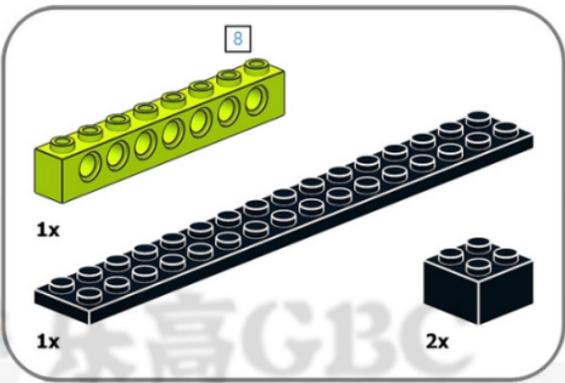
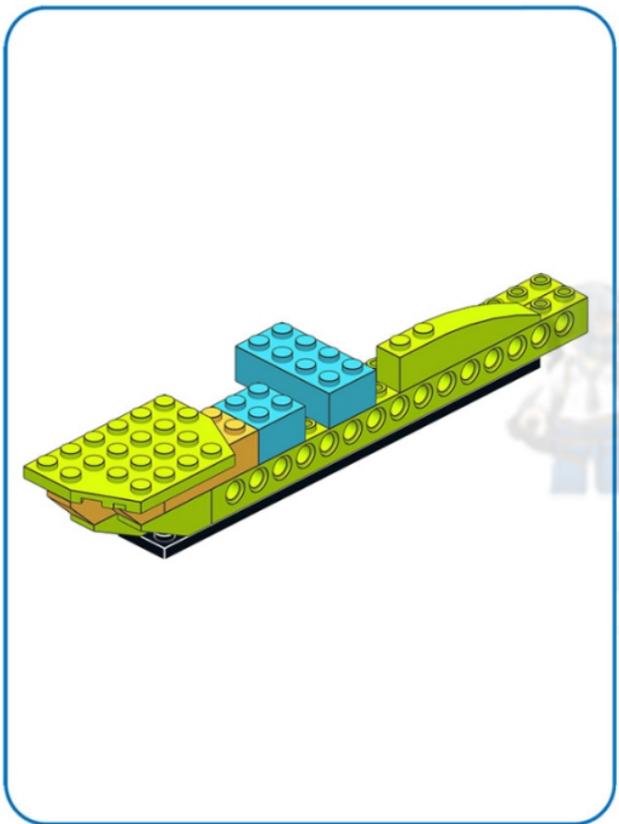


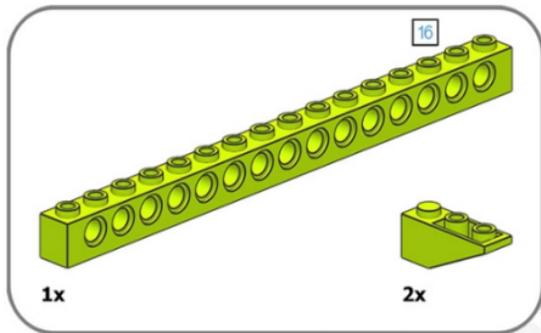
9



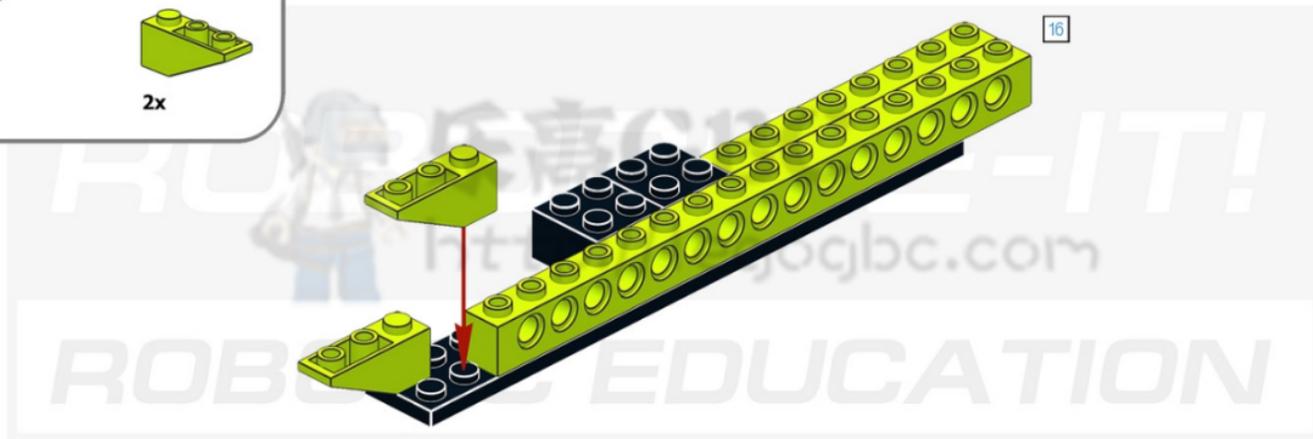
10

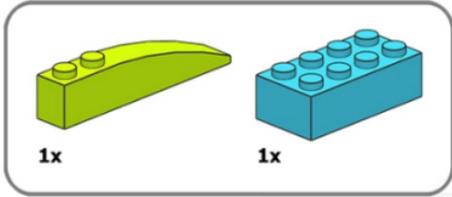




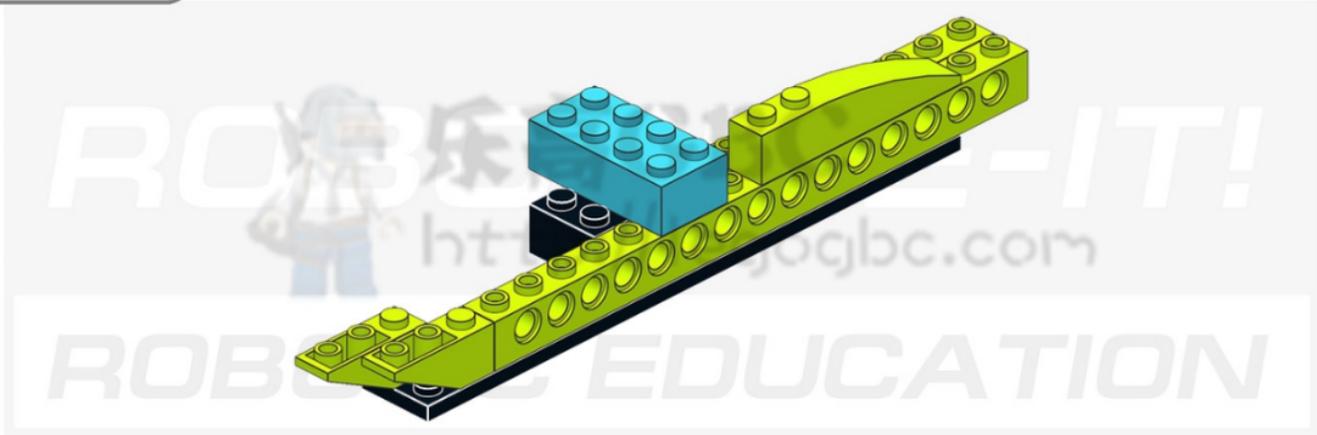


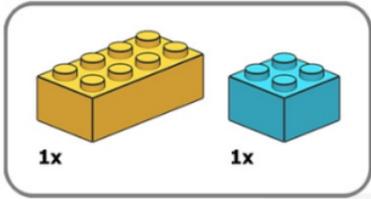
12



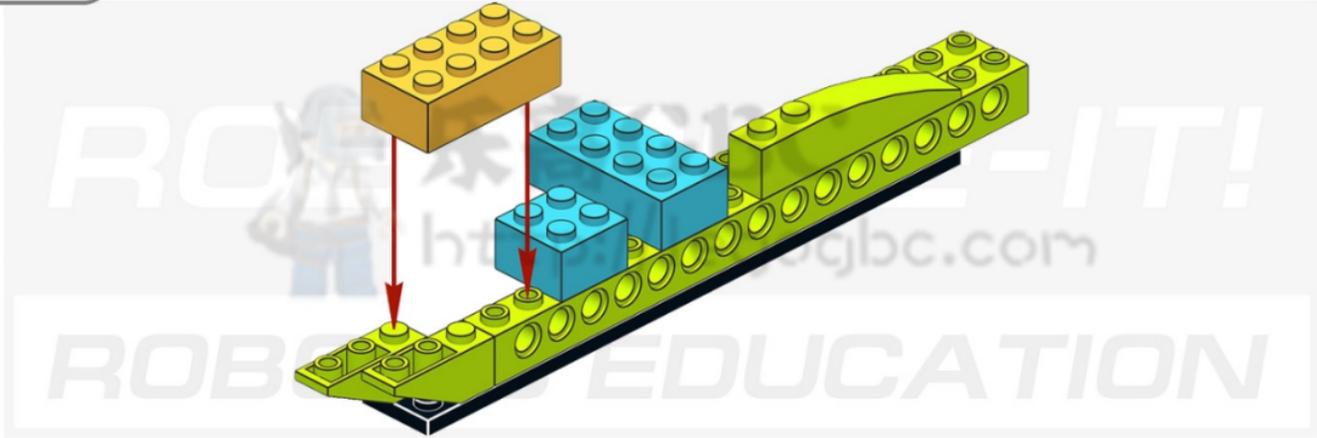


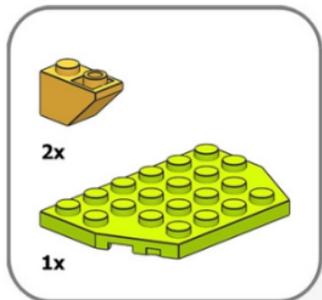
13



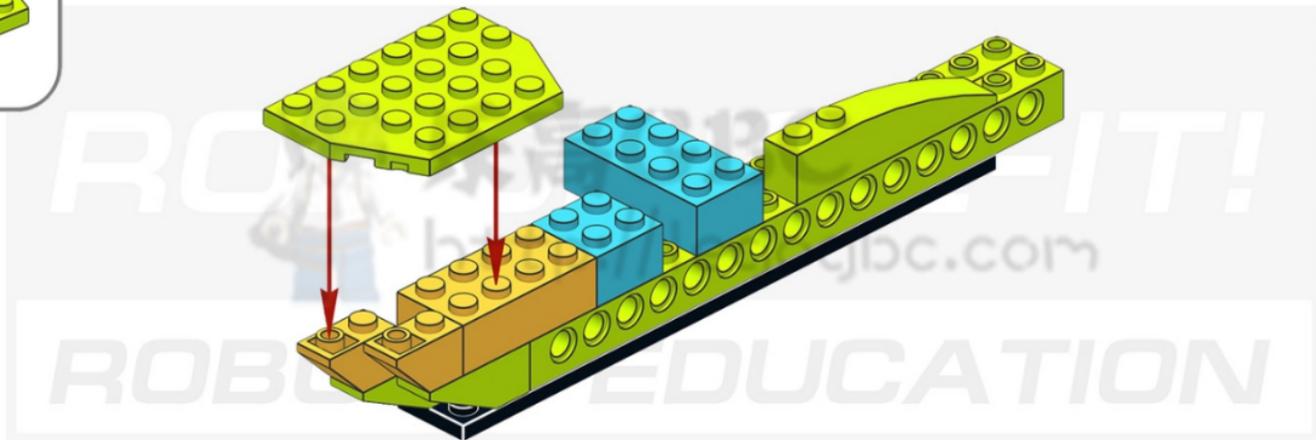


14

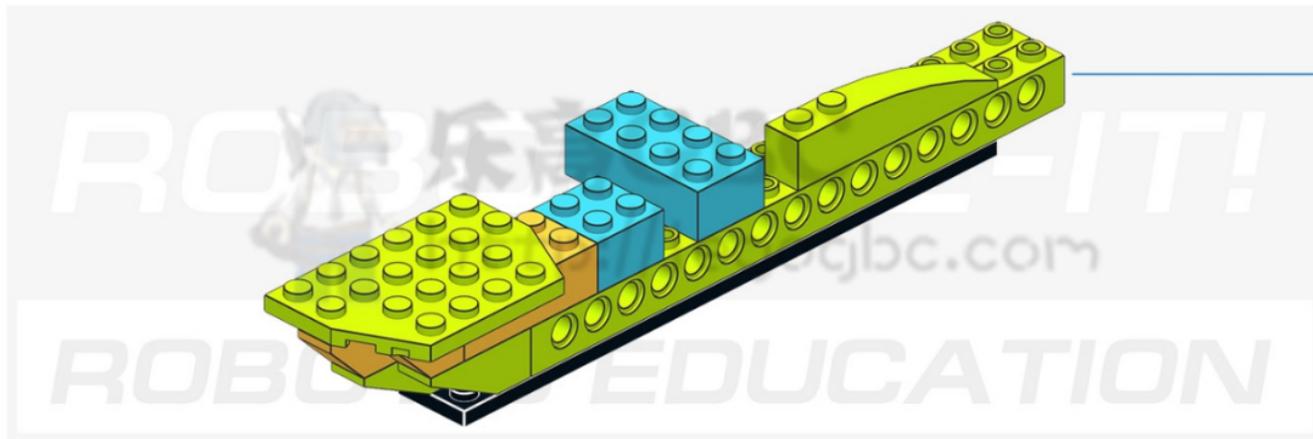




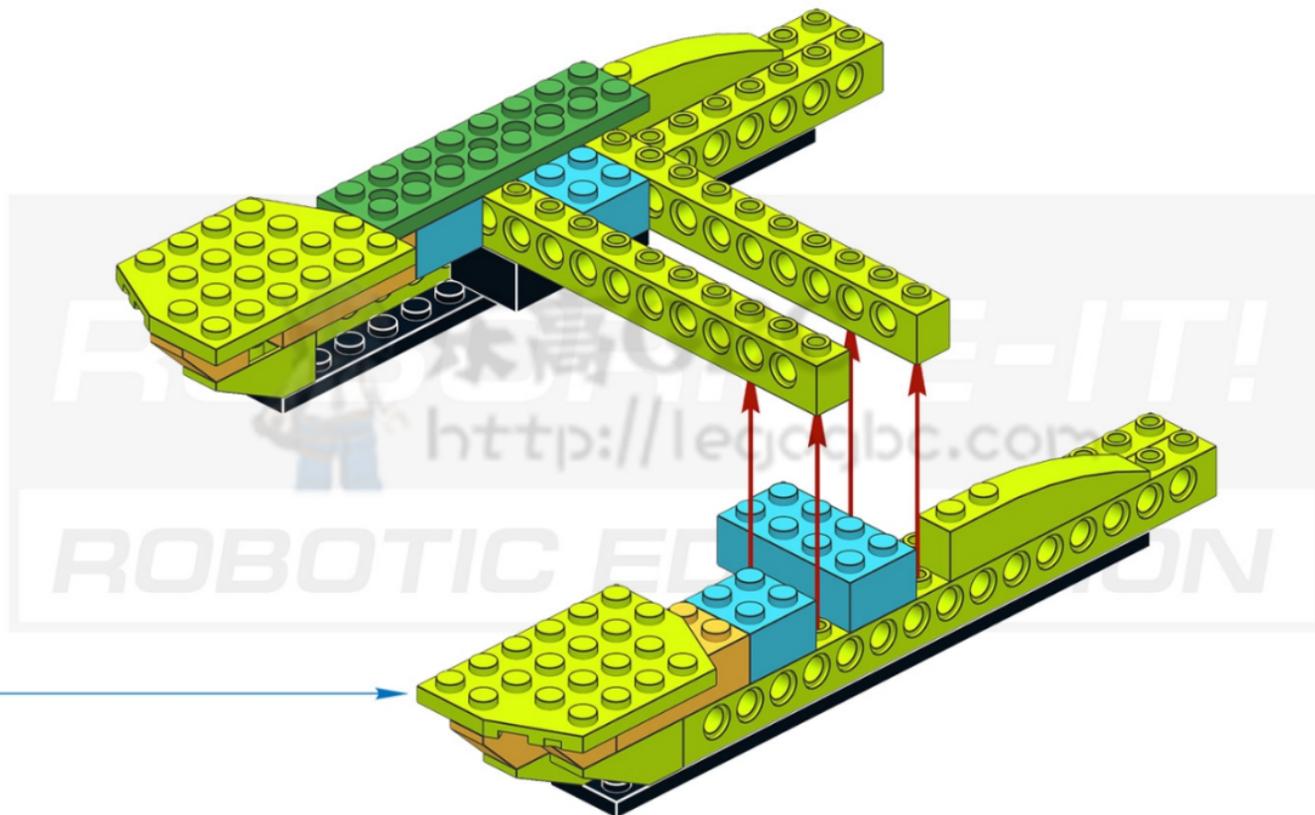
15

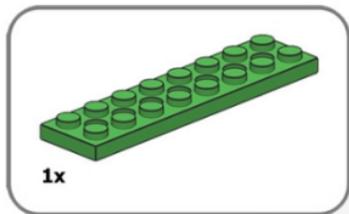


16

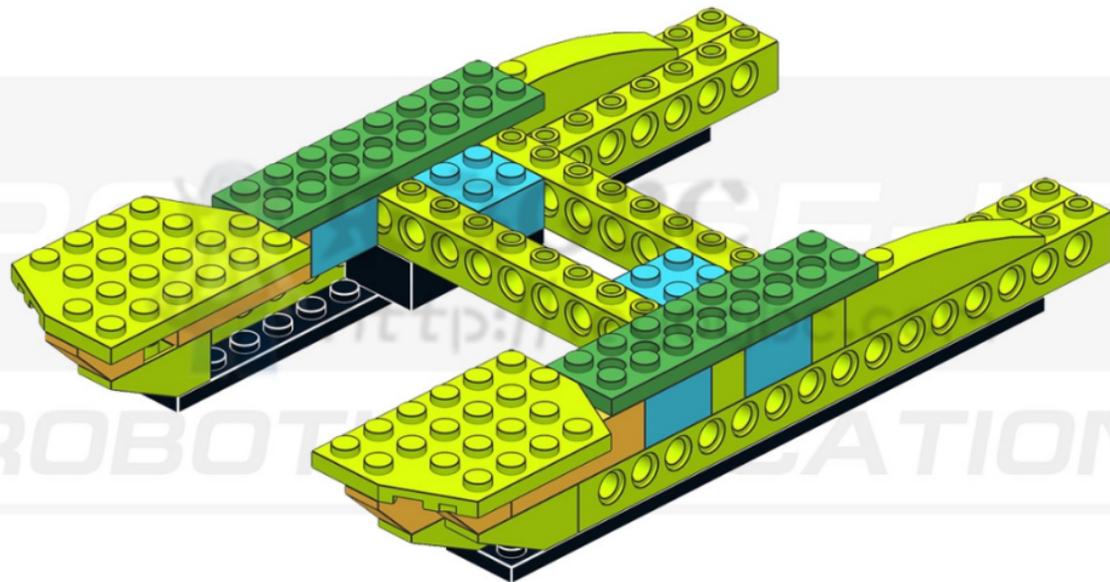


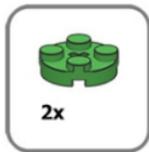
17



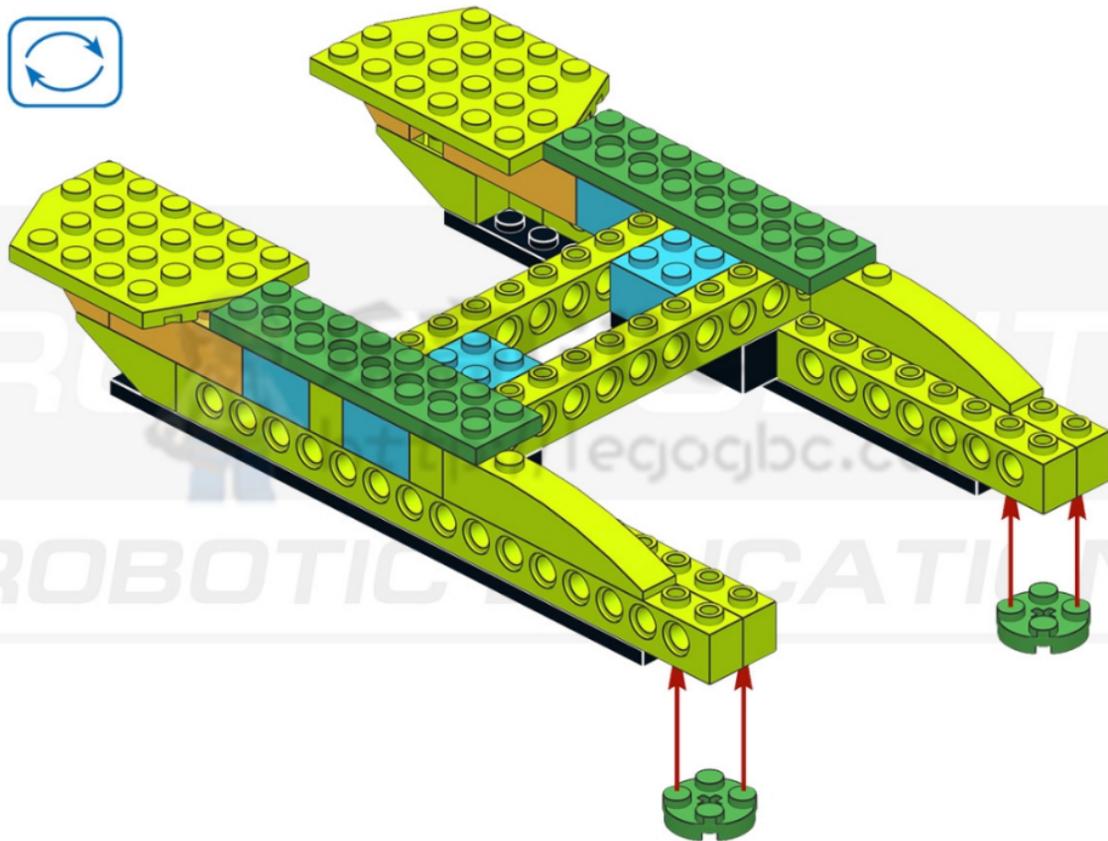


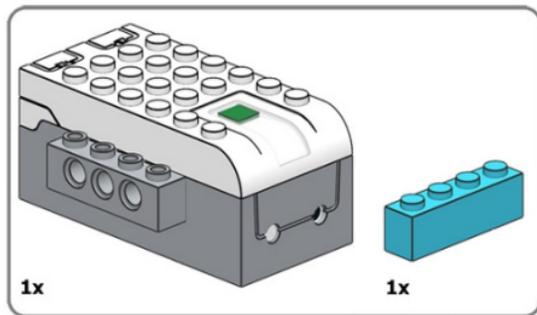
18



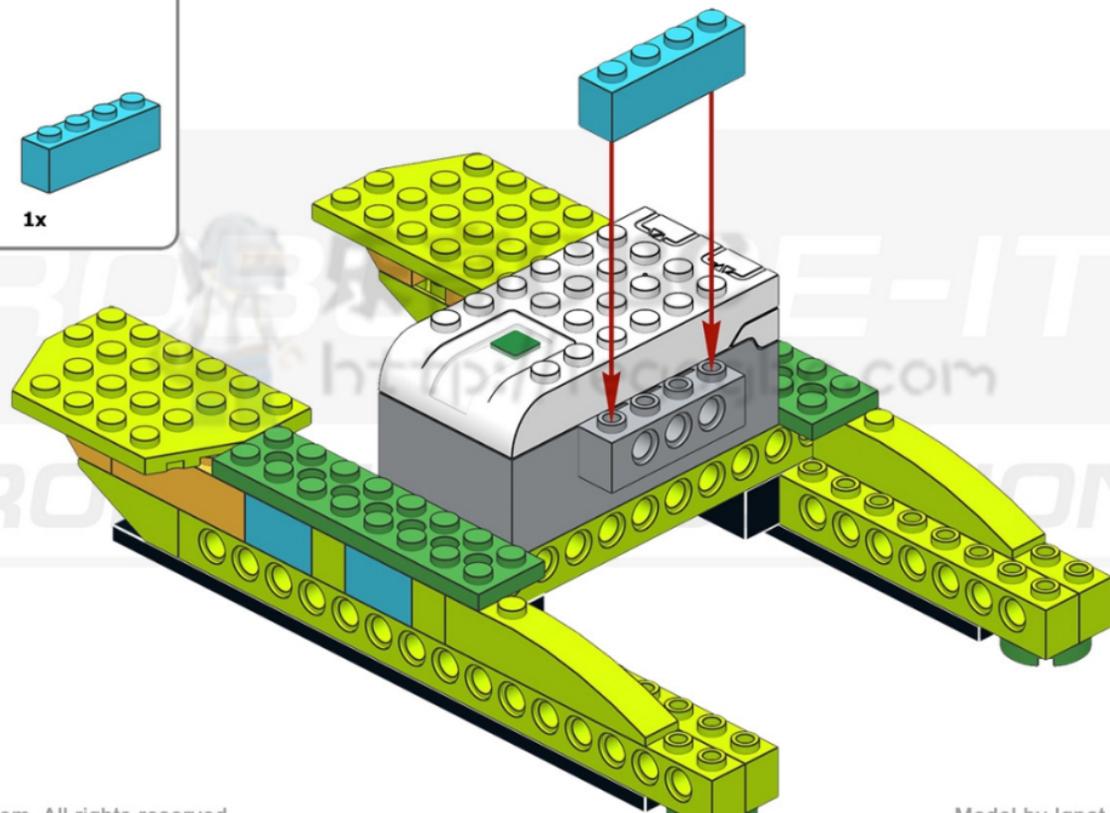


19

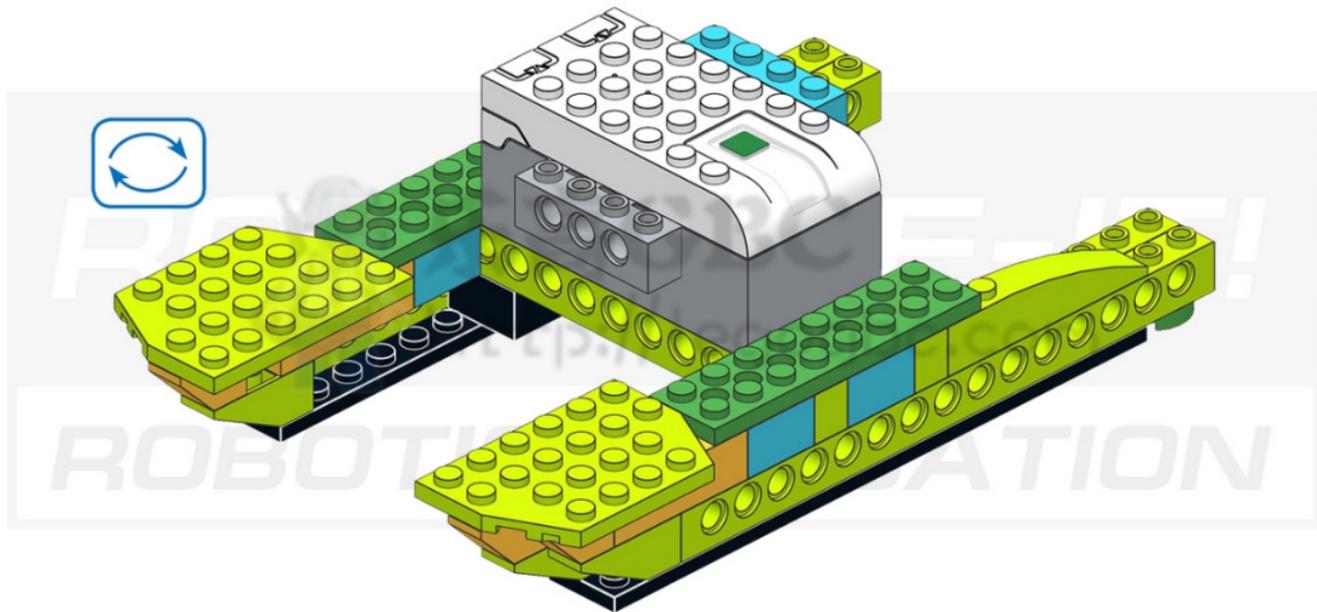


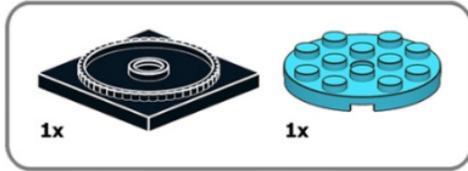
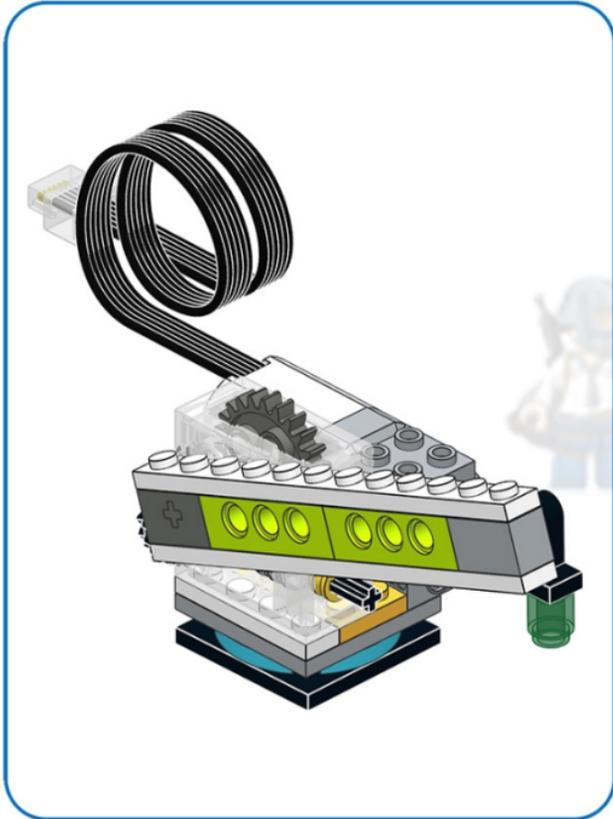


20

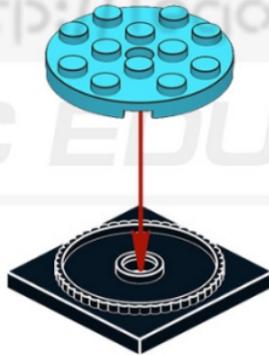


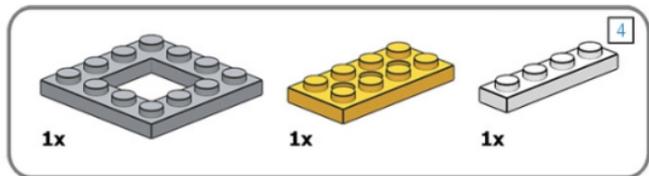
21



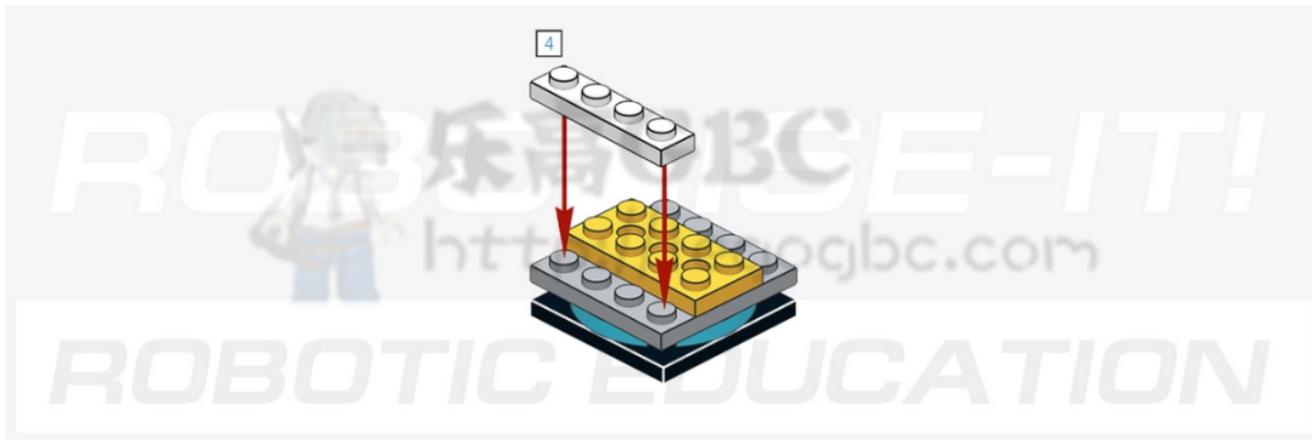


22



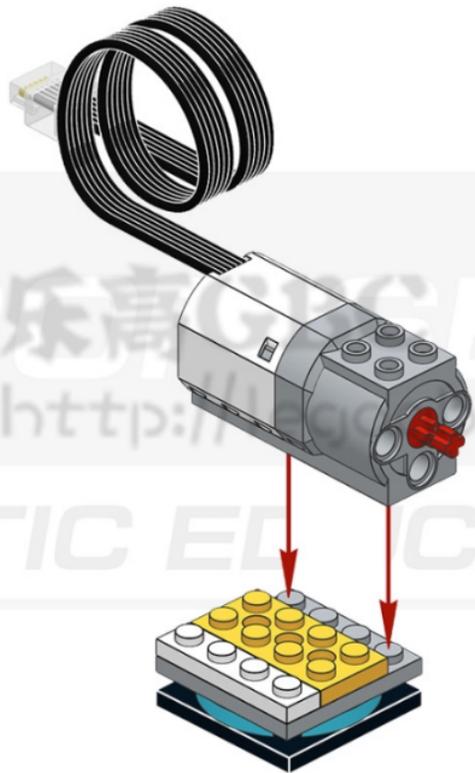


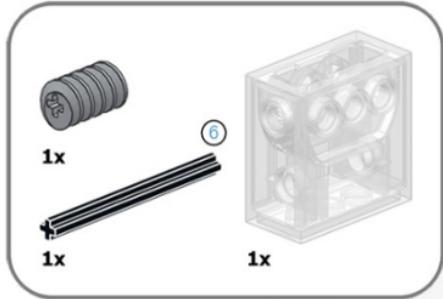
23



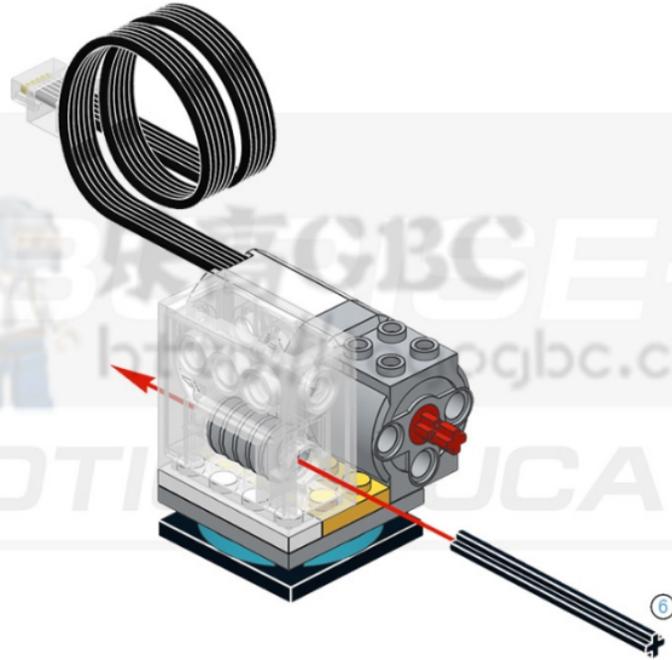


24



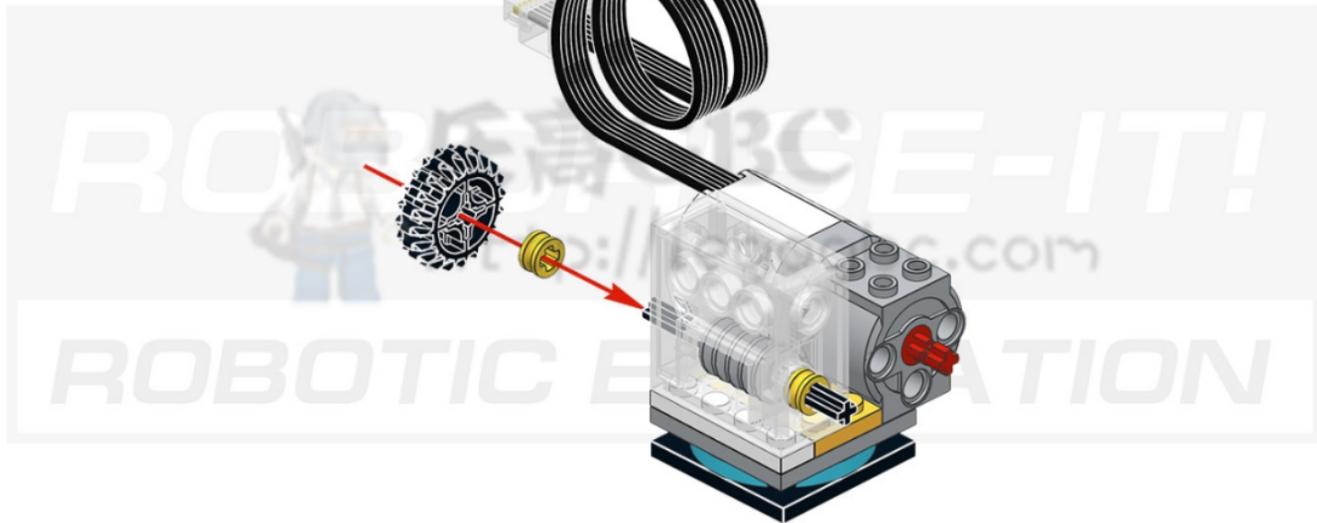


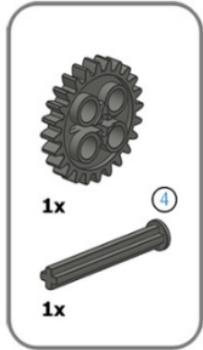
25



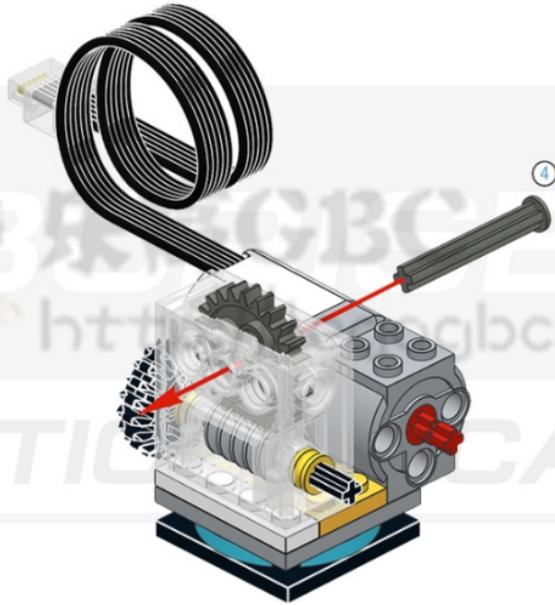


26



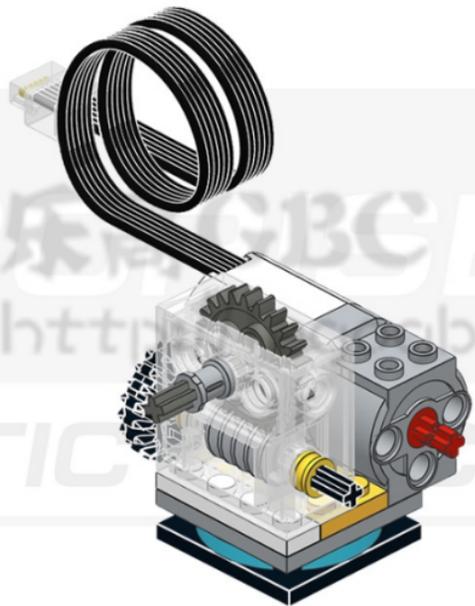


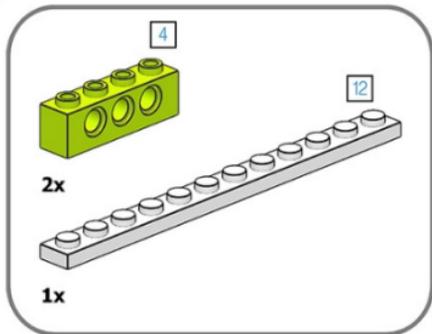
27



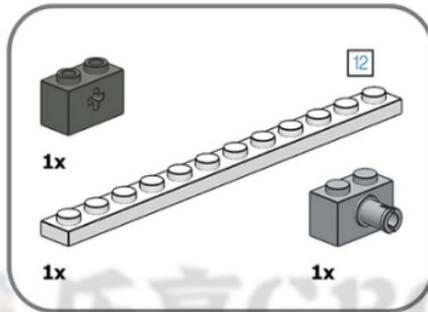
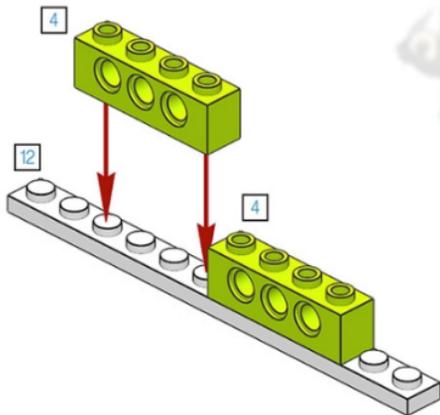


28

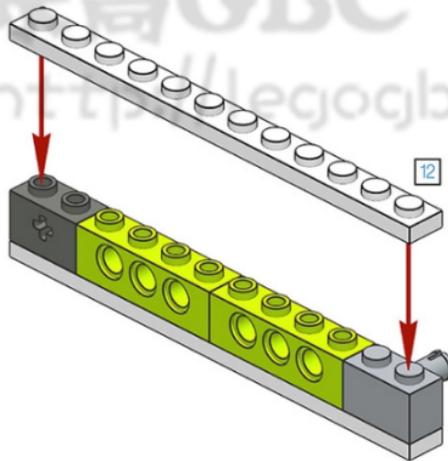




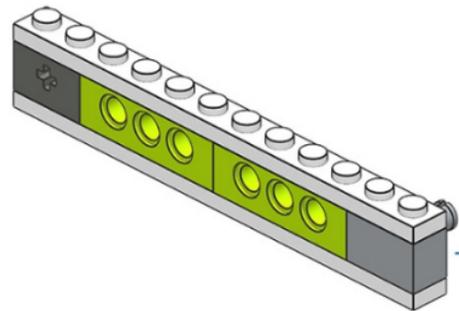
1



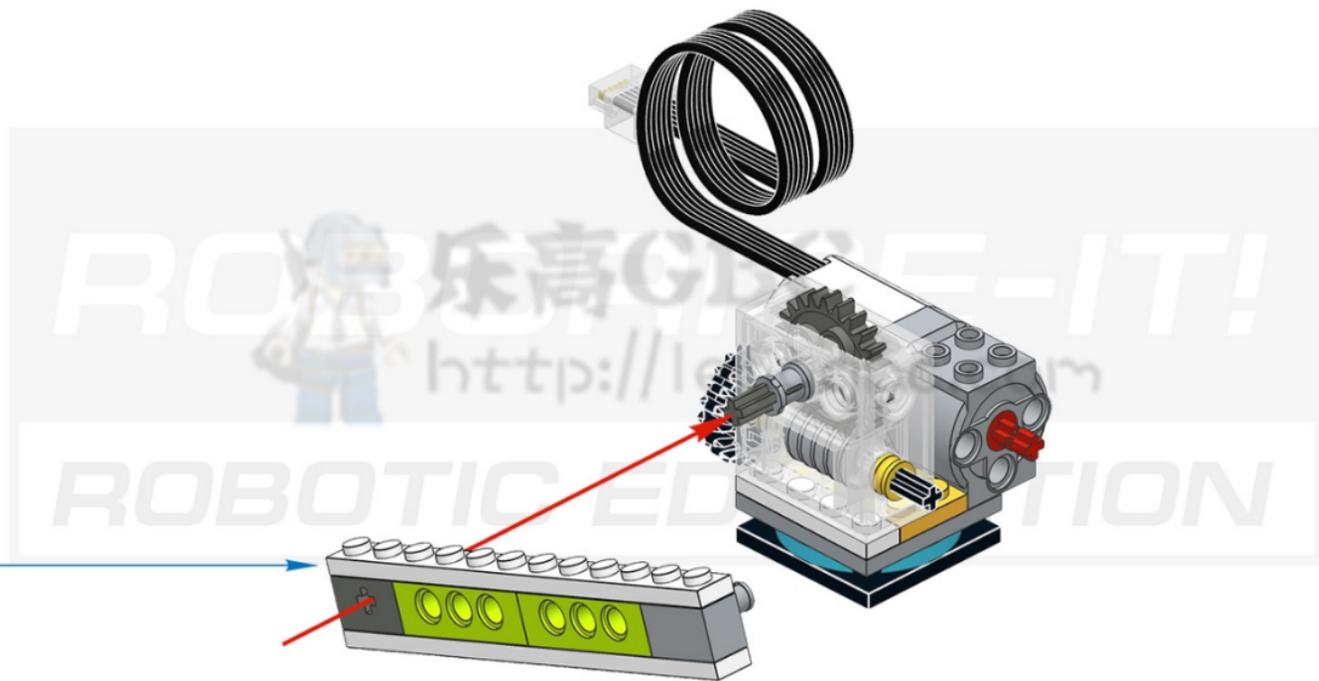
2



3



30



1x 1x

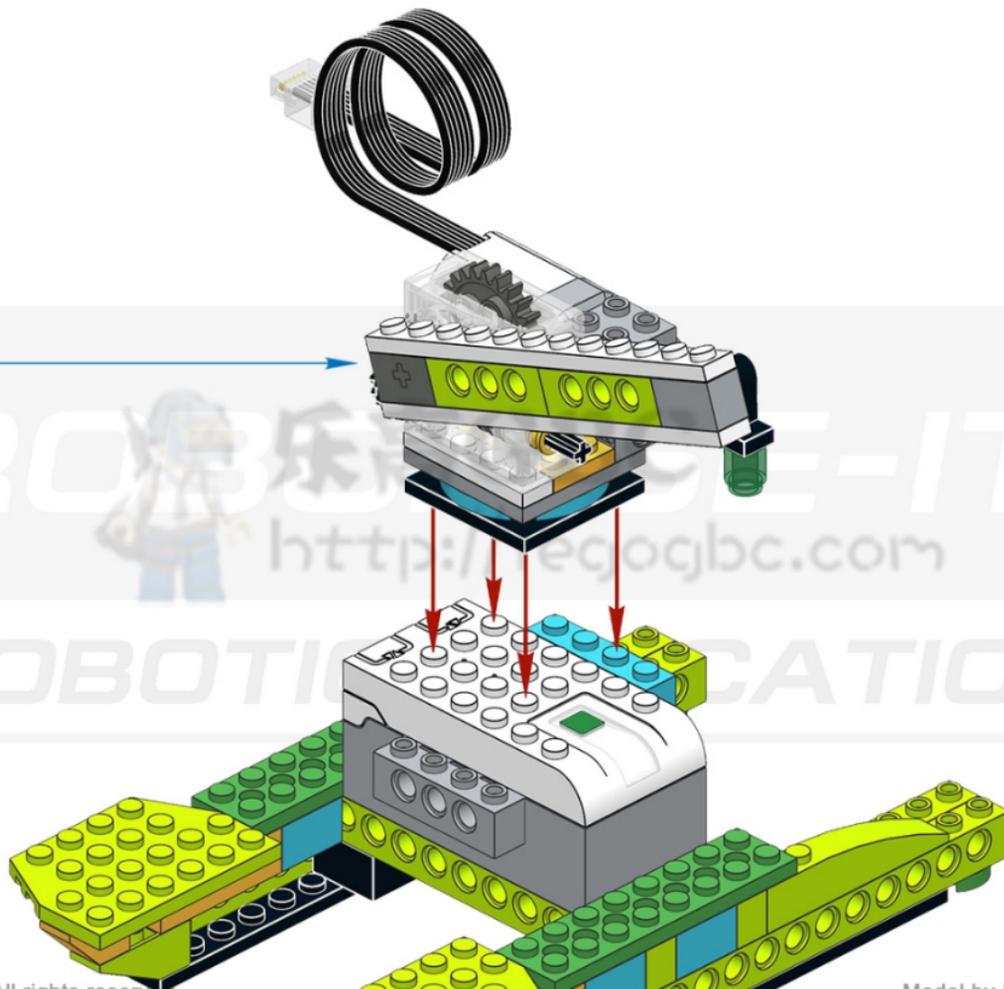
1

2

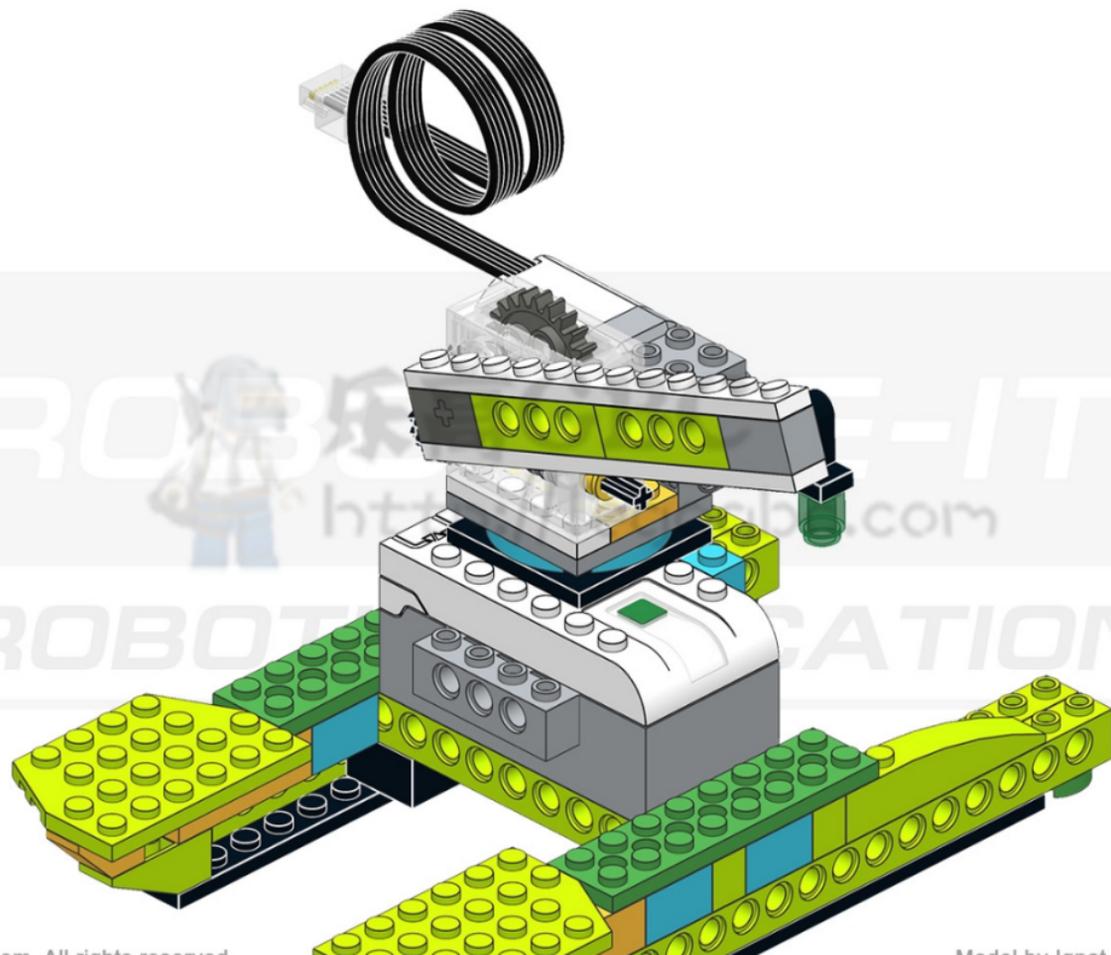




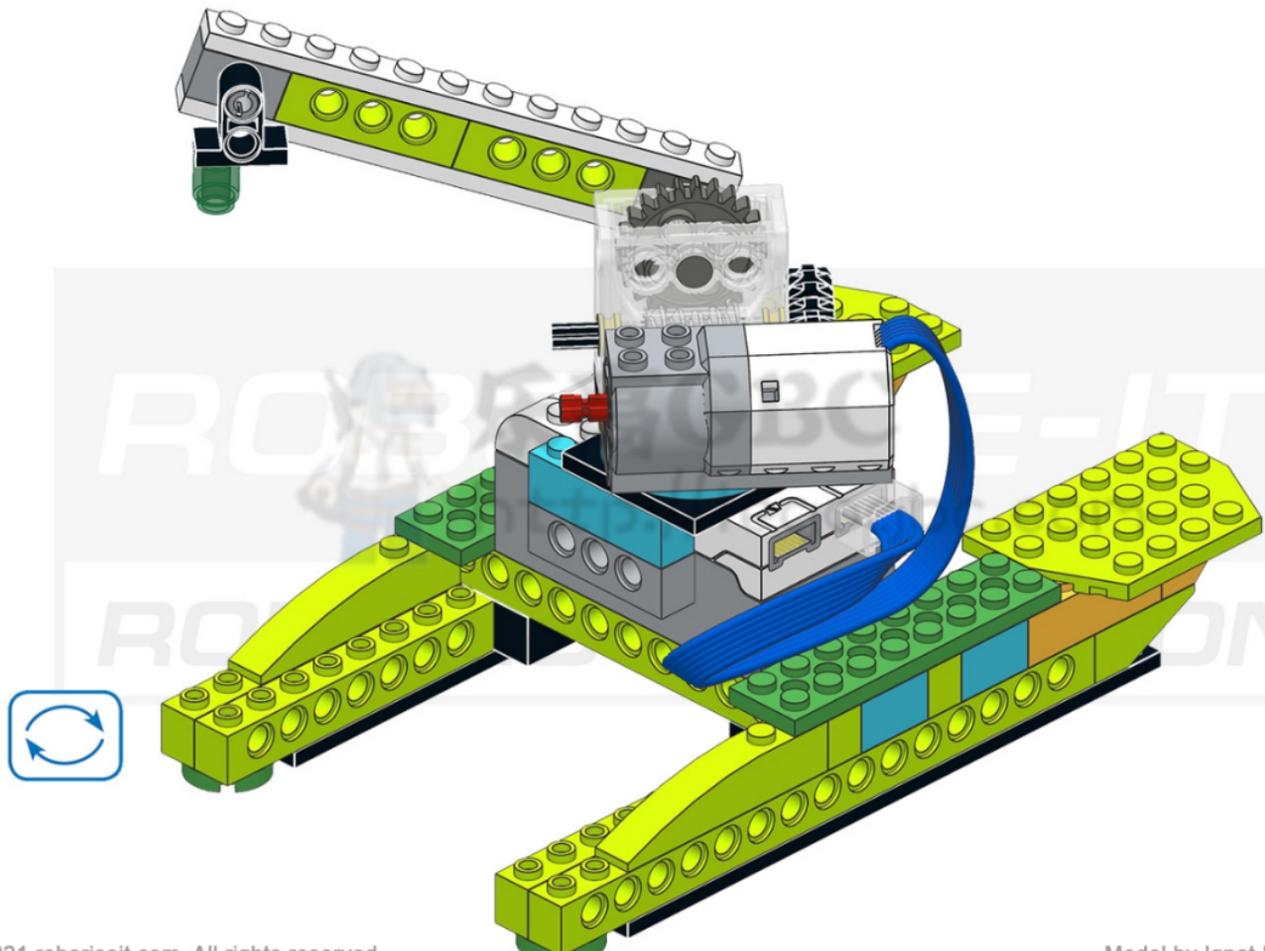
33



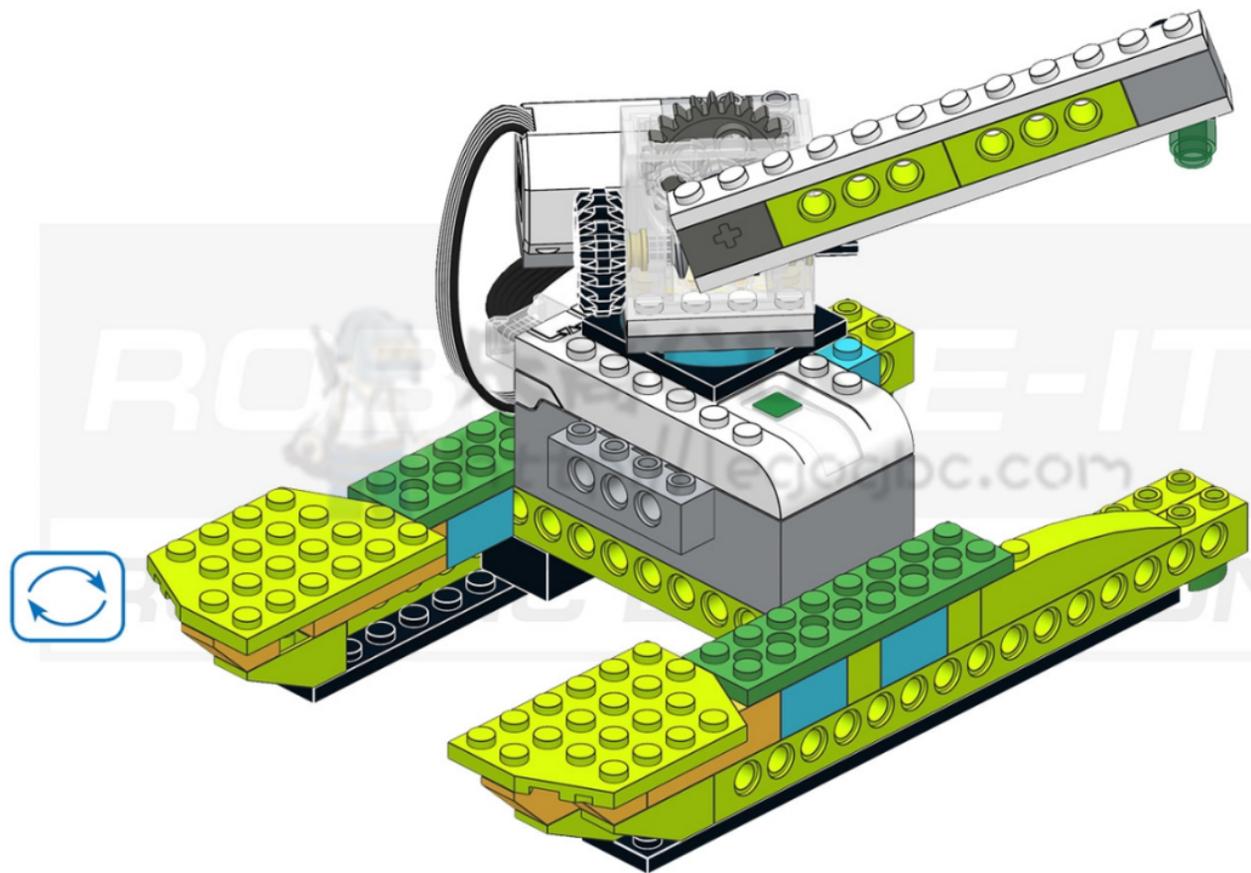
34



35



36



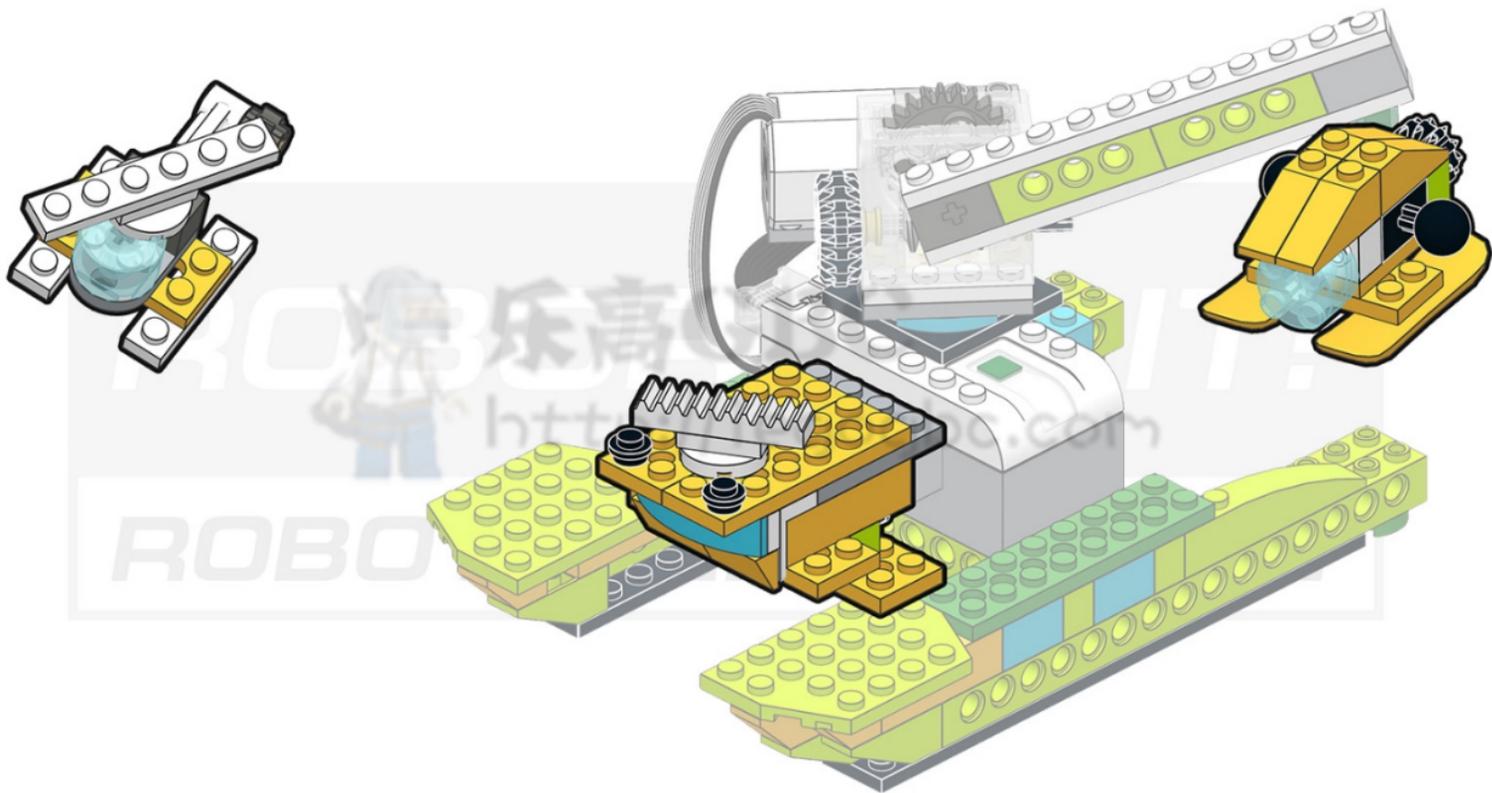


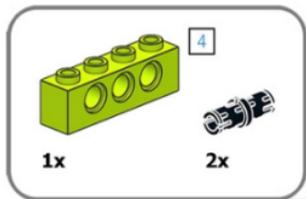
Extended version

Complete the helicopter, underwater drone and captain's bridge

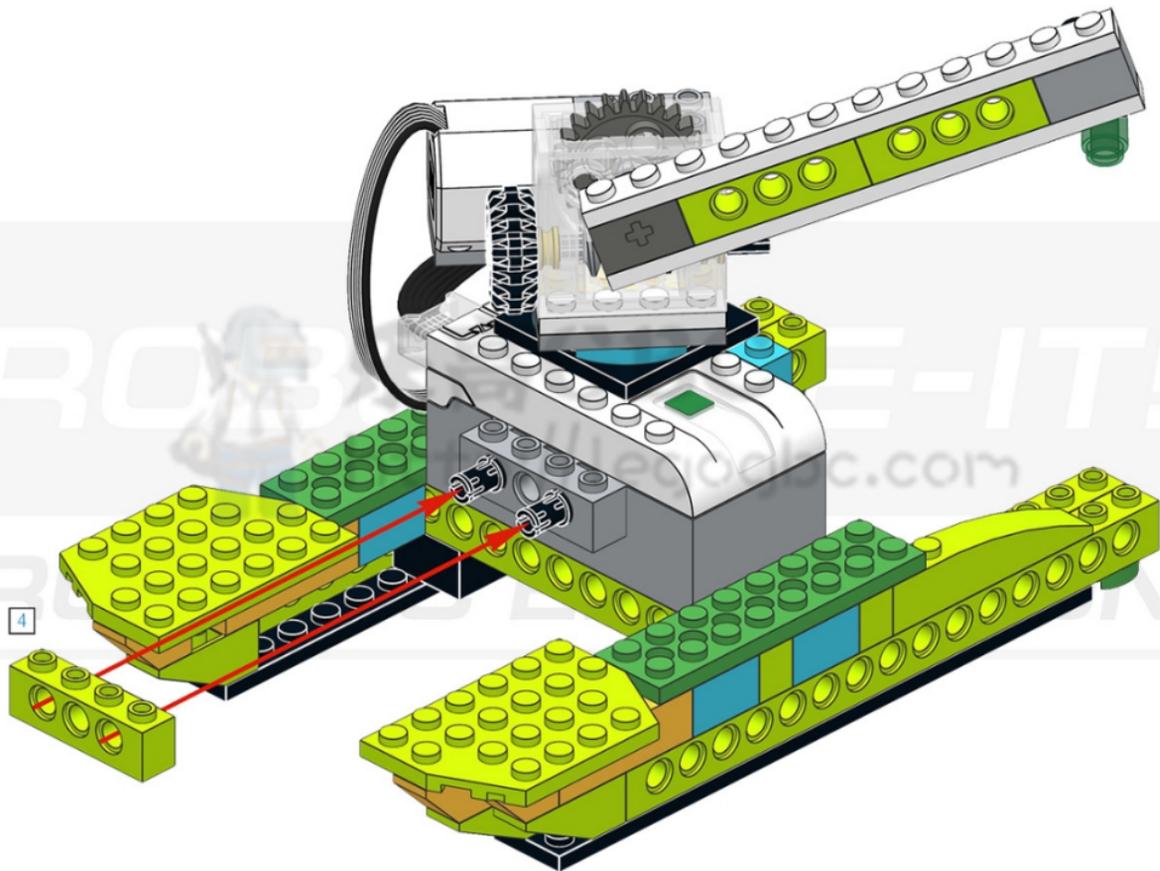


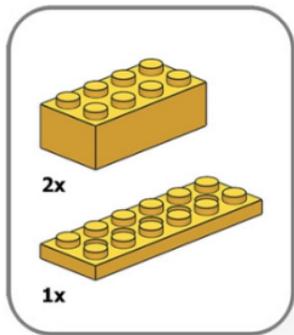
Go to the first slide of
the instruction



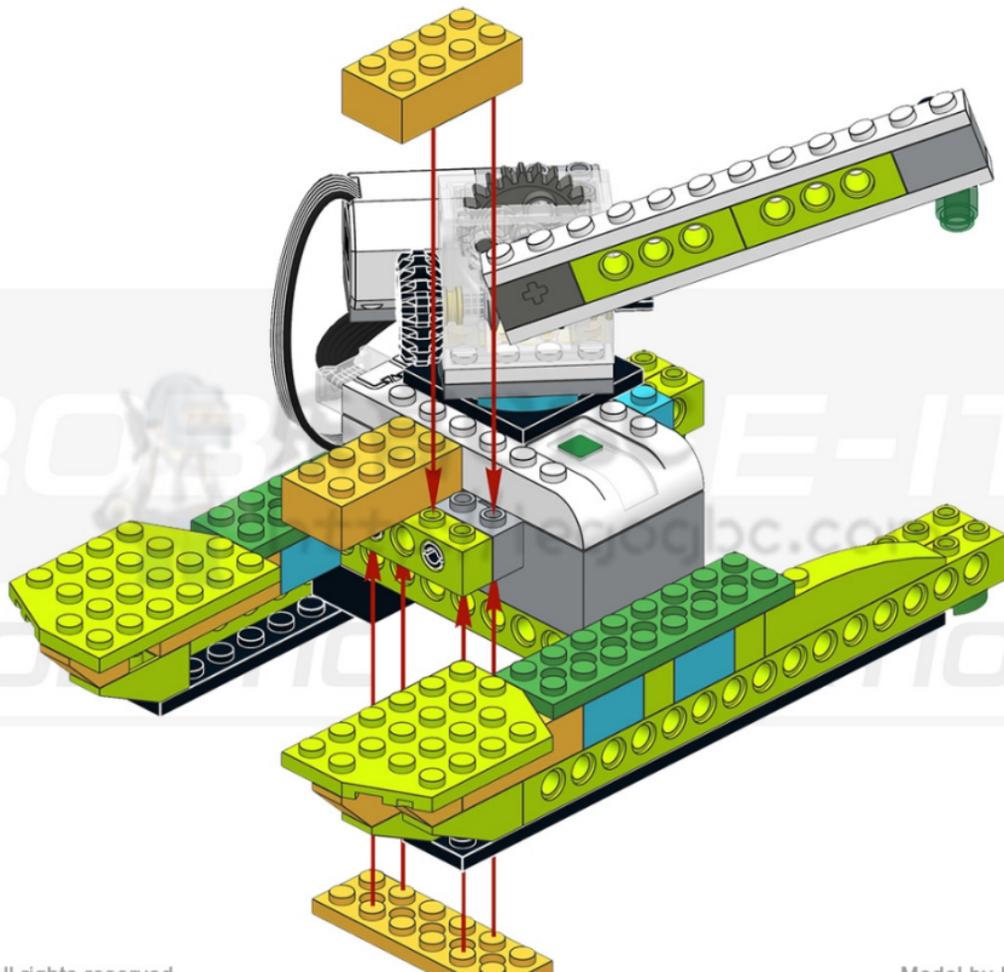


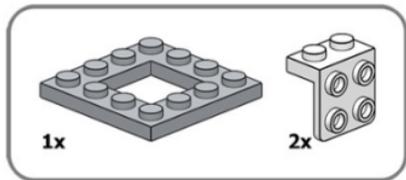
38



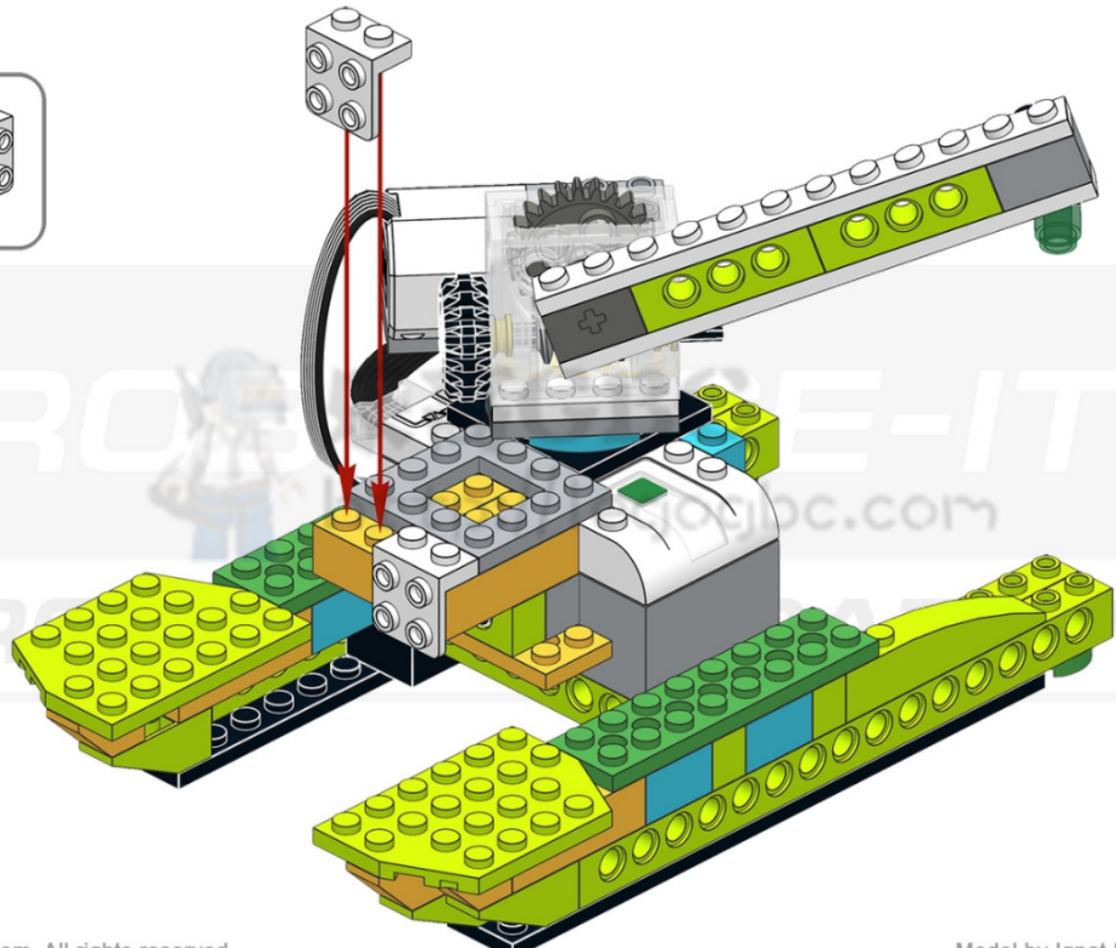


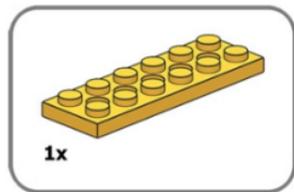
39



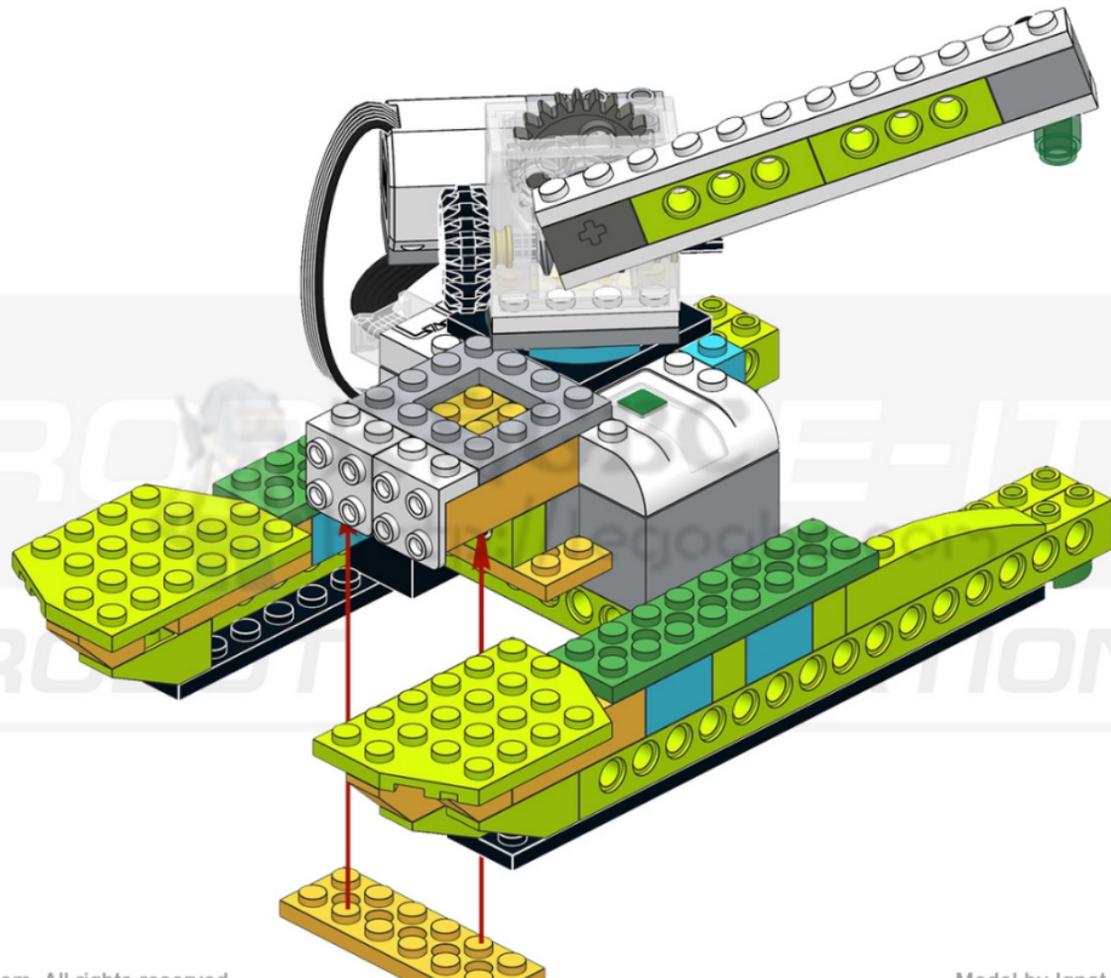


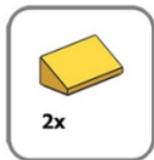
40



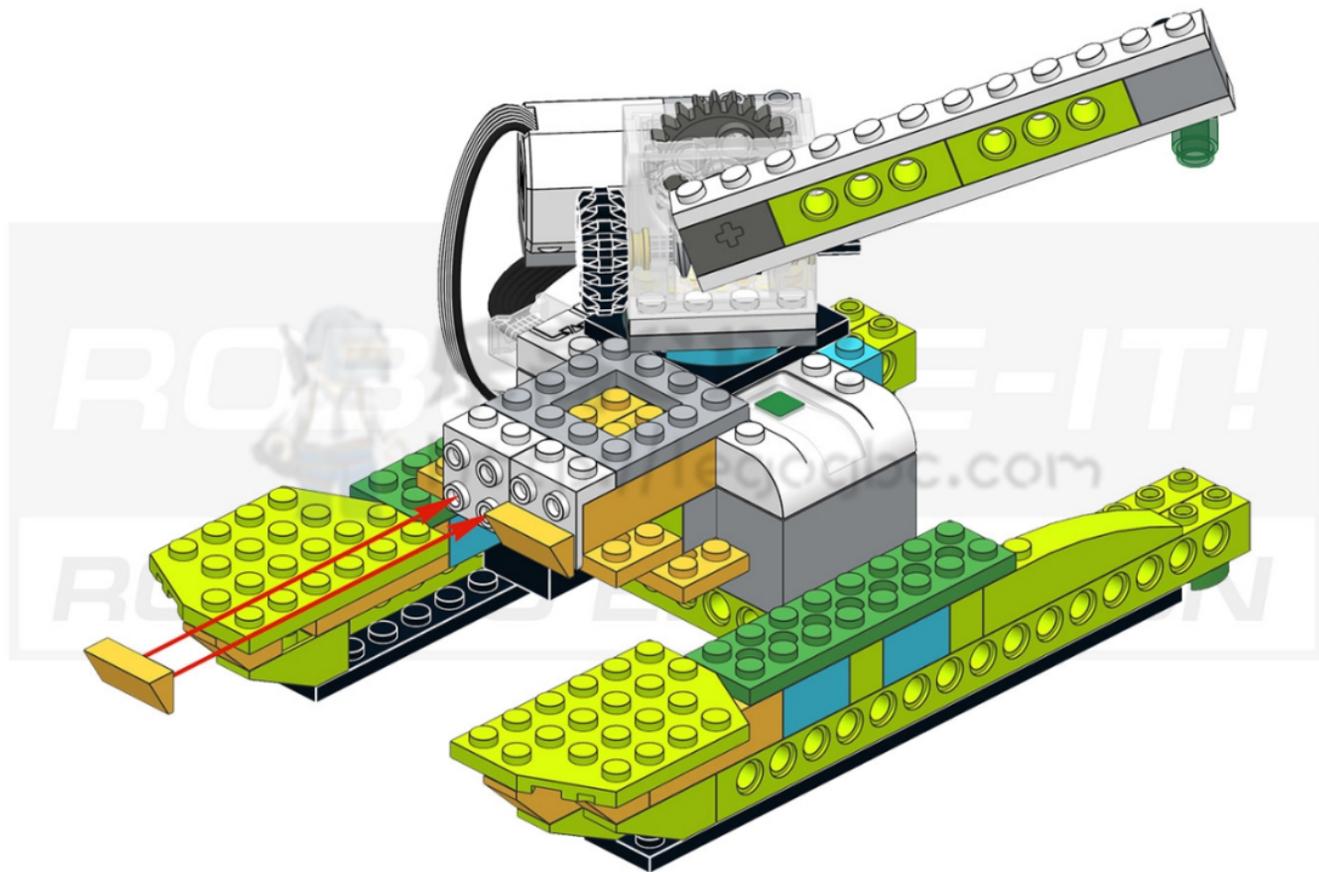


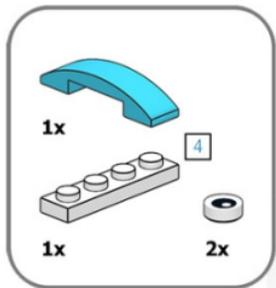
41



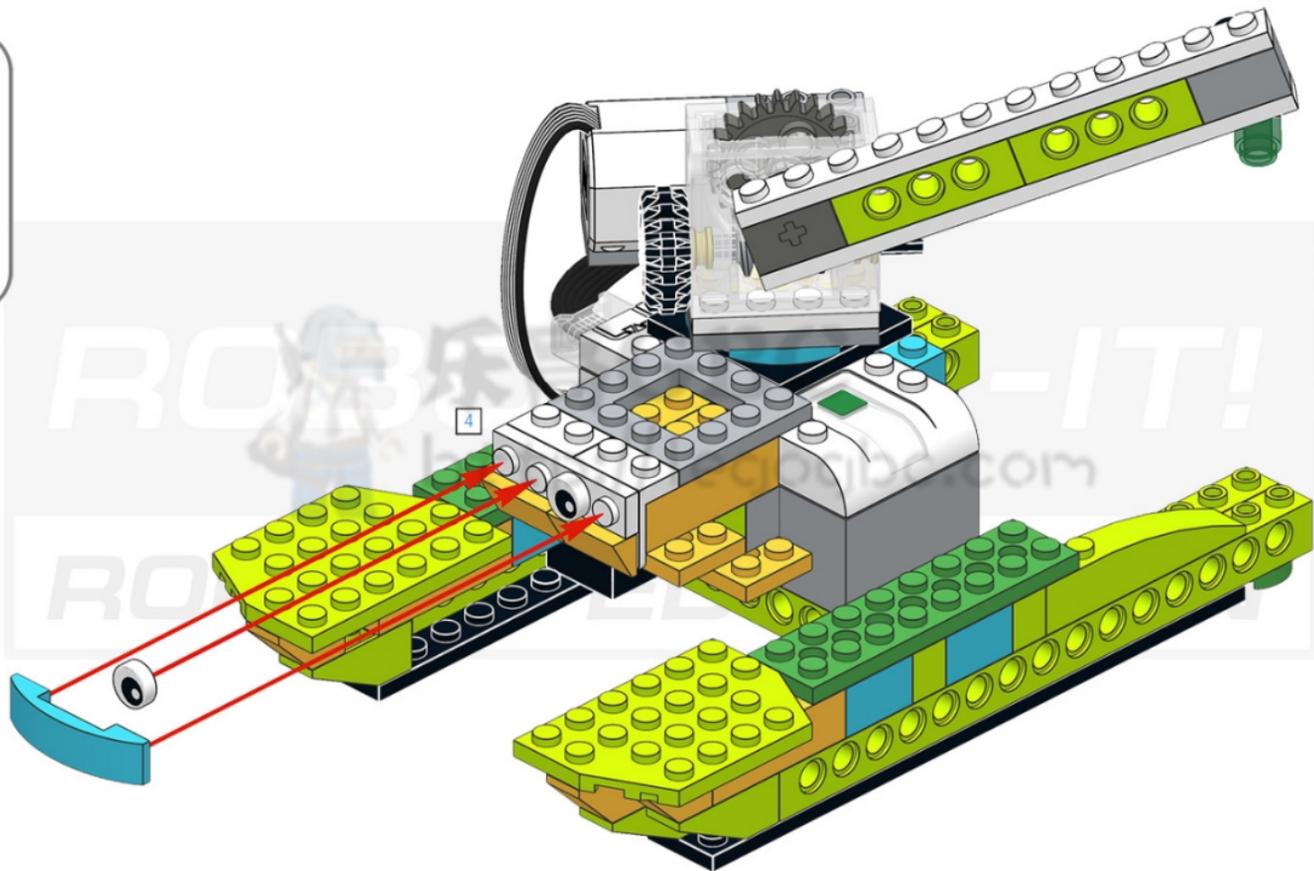


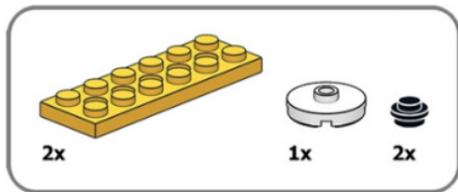
42



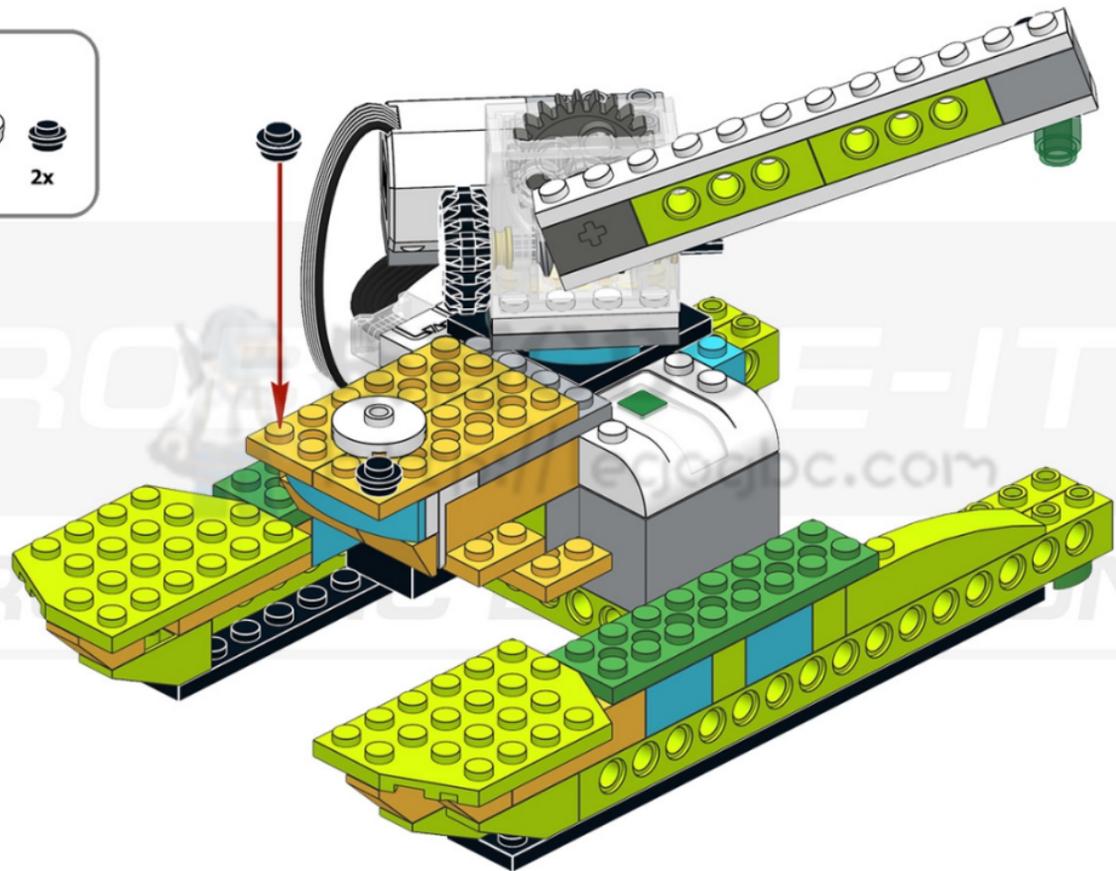


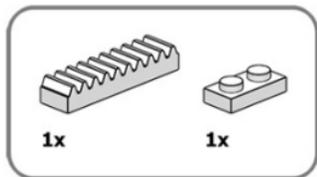
43



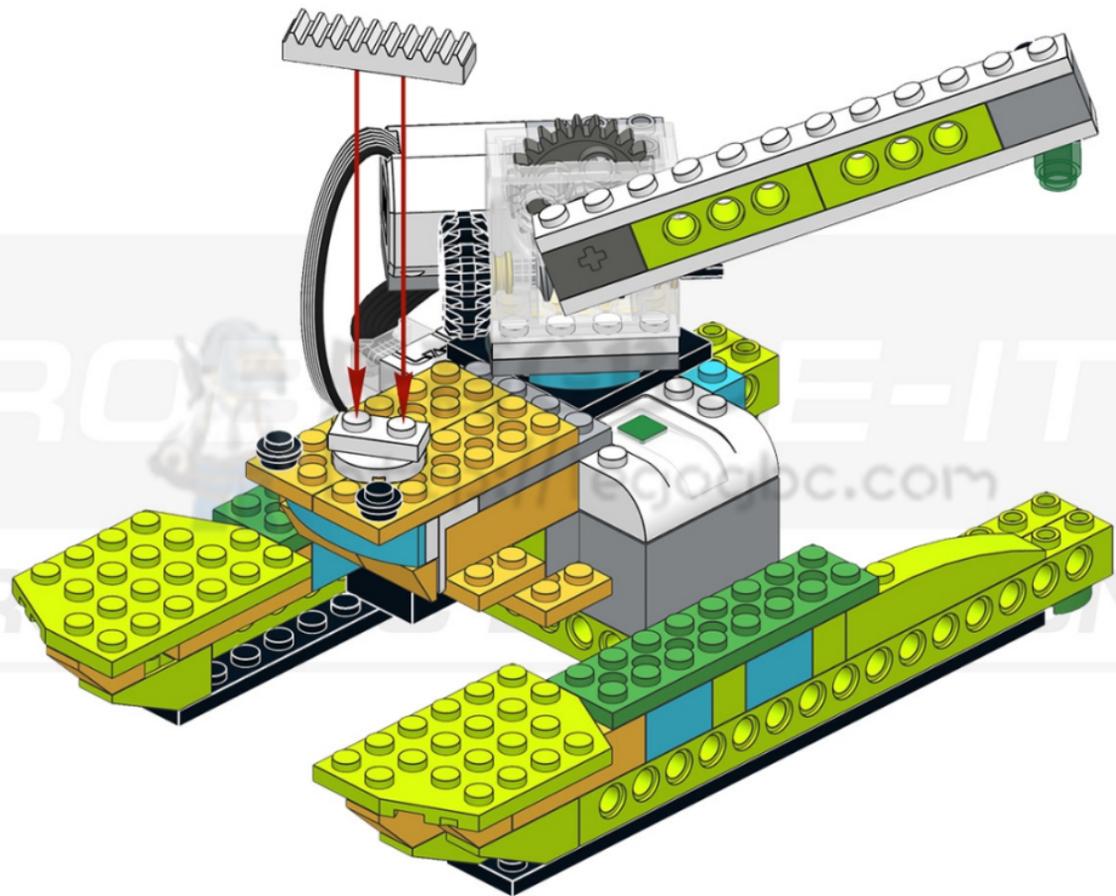


44

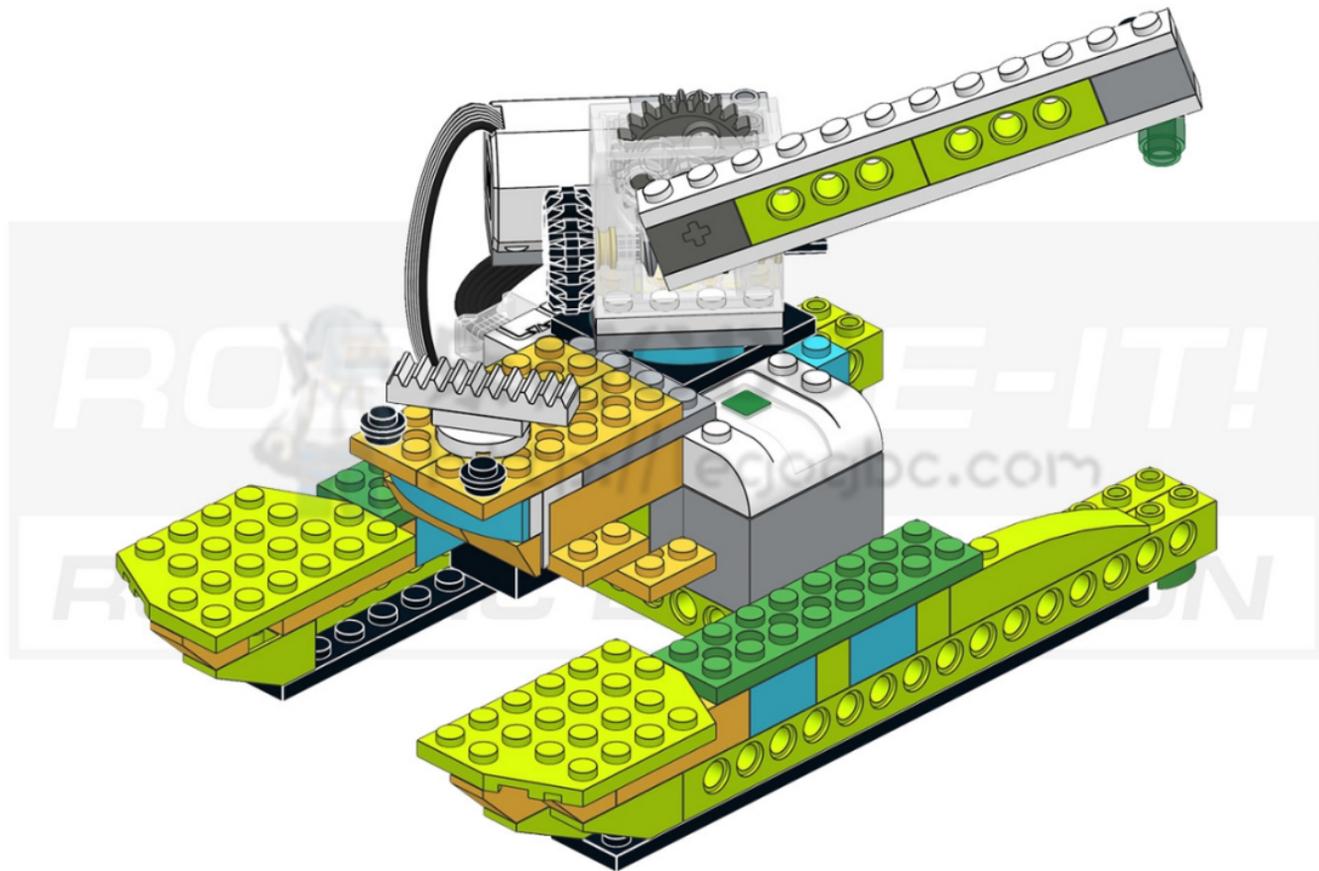


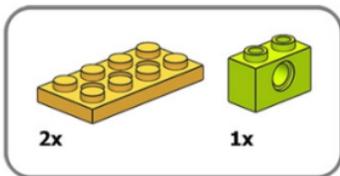
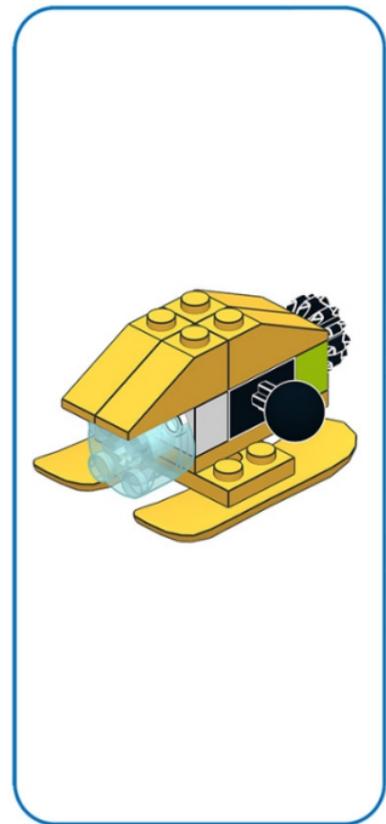


45

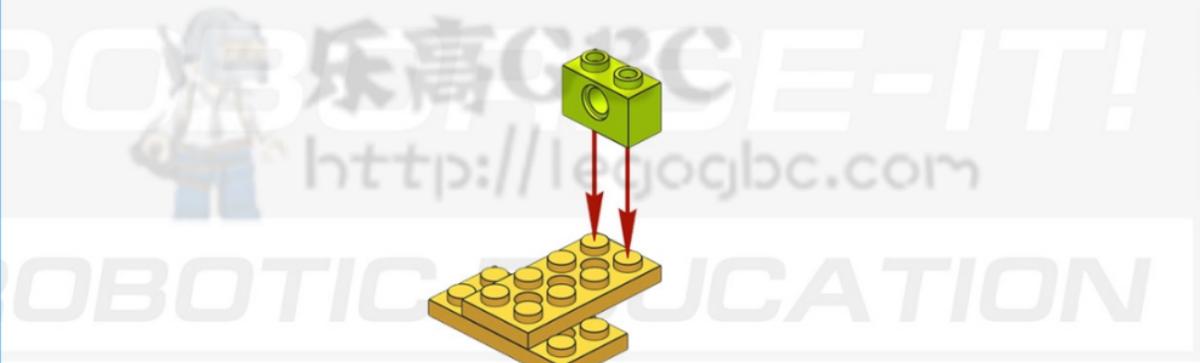


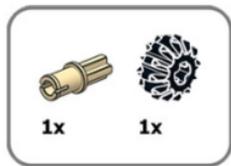
46



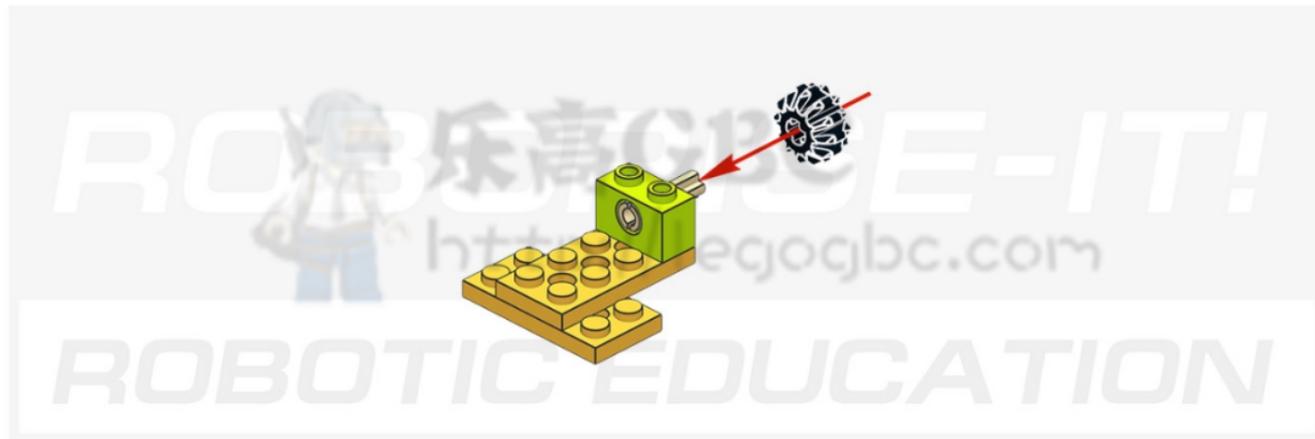


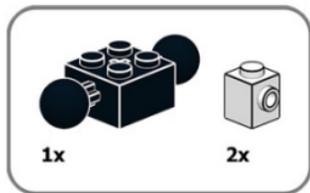
47



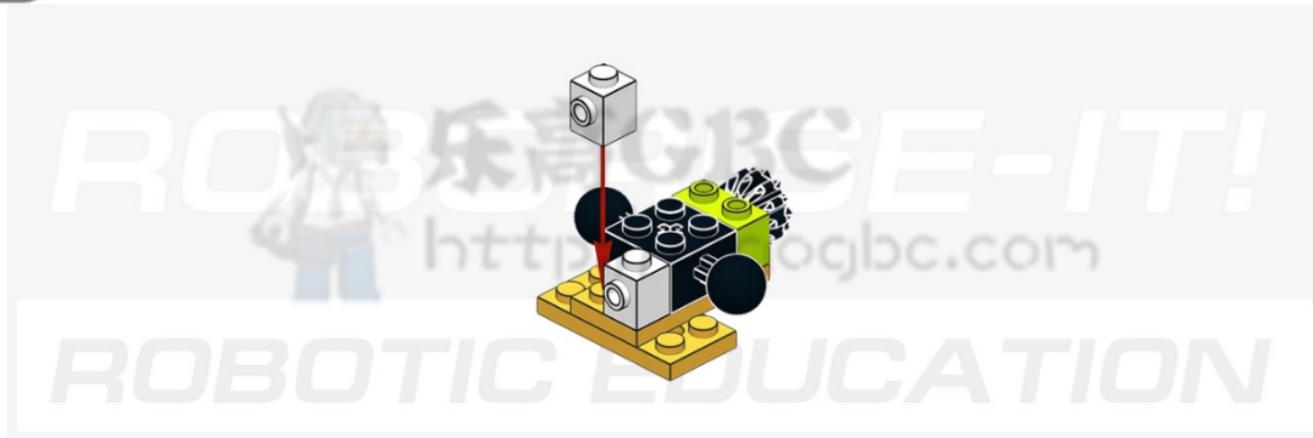


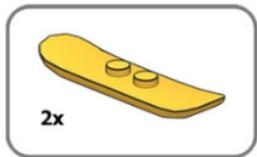
48





49



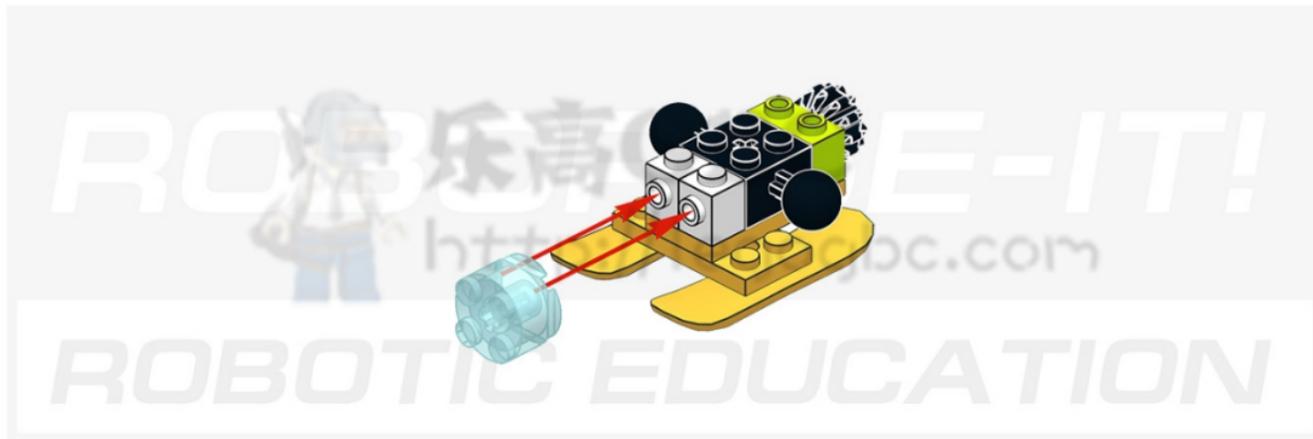


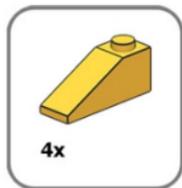
50



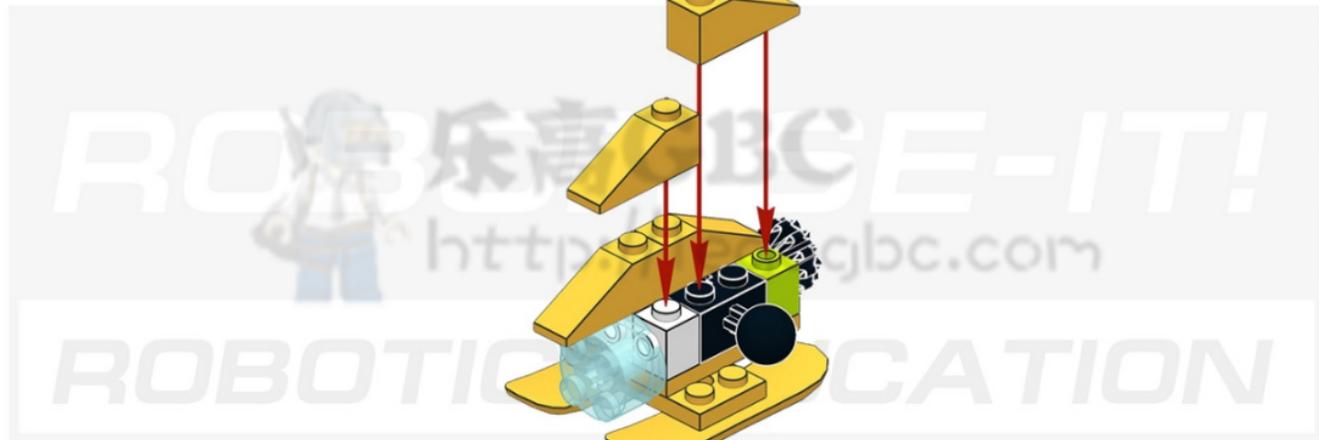


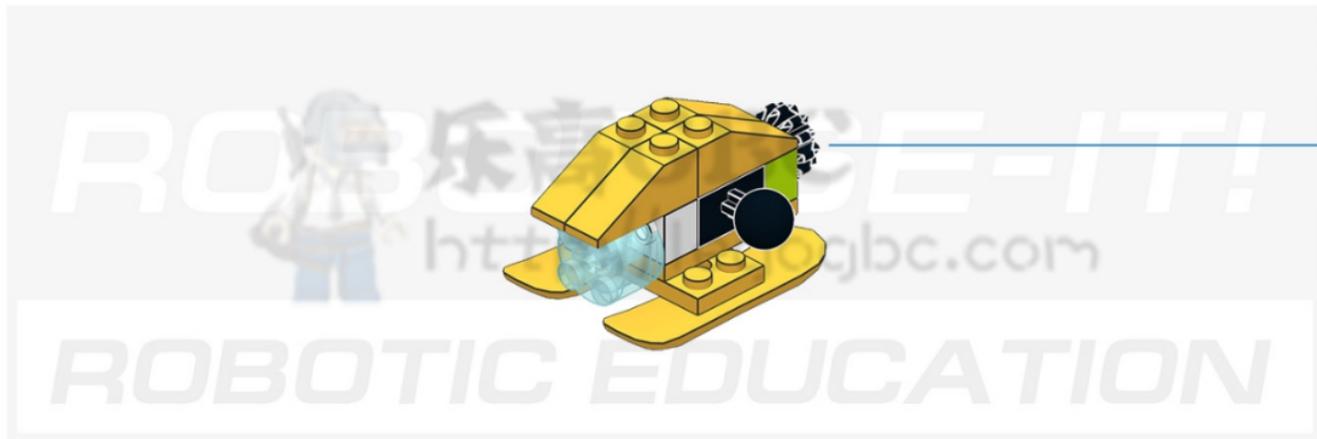
51



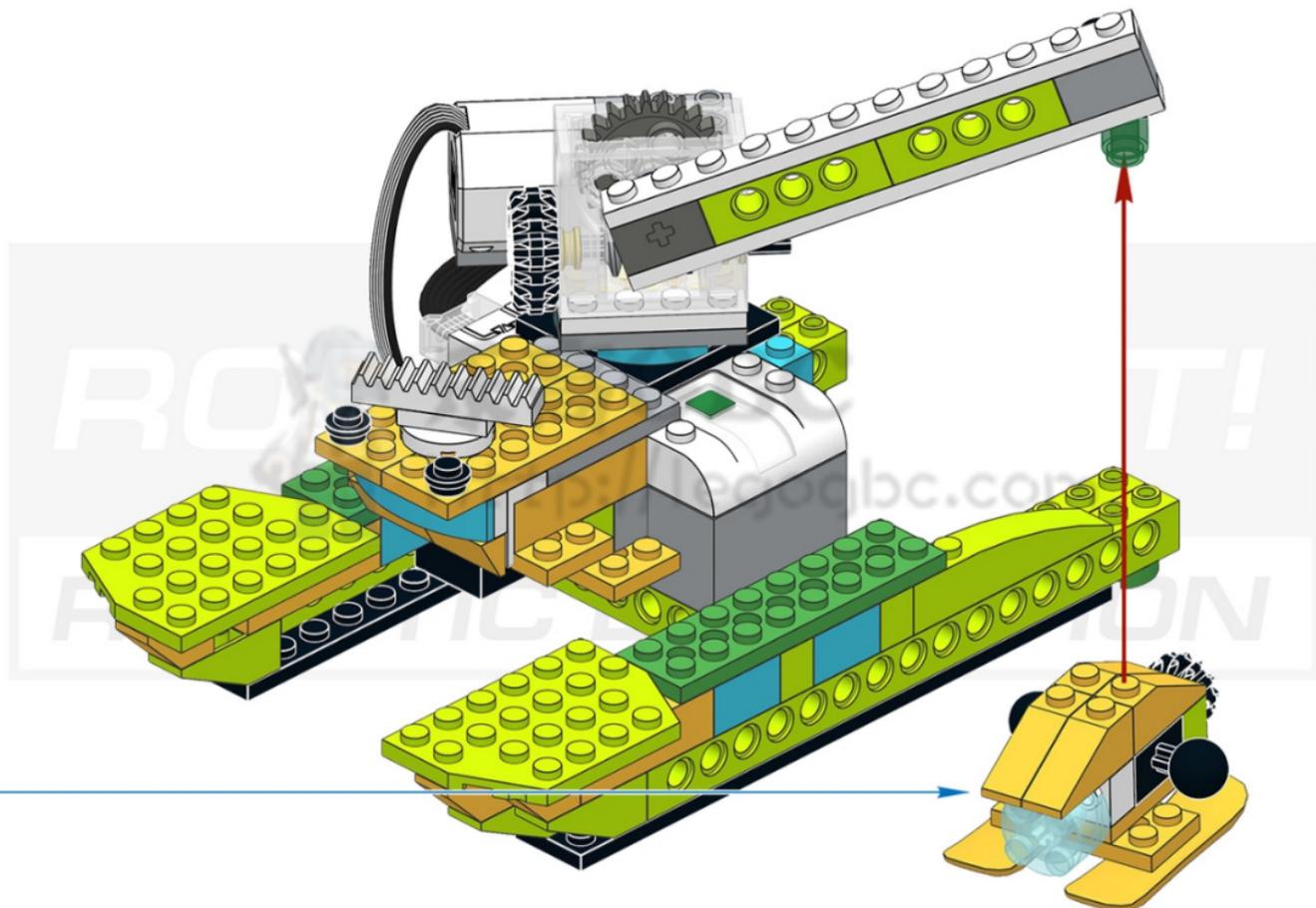


52

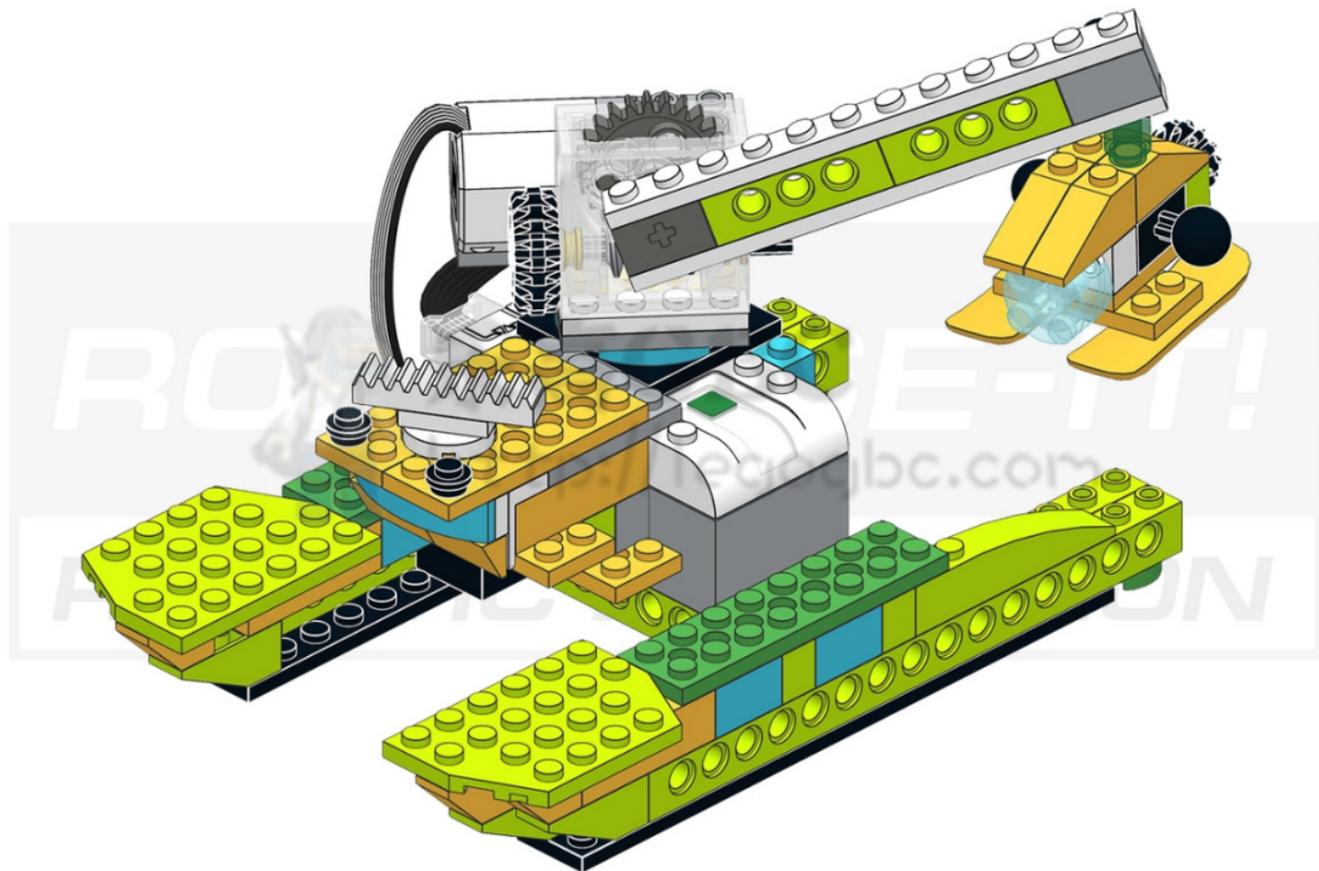


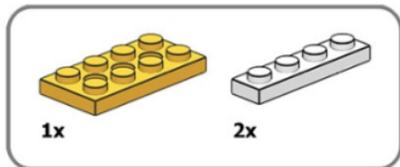


54

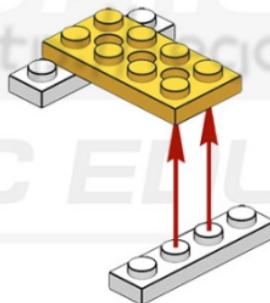
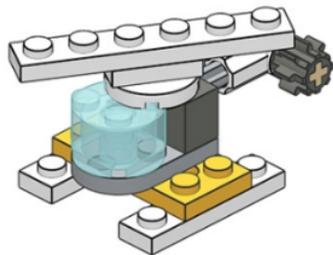


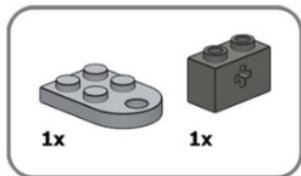
55



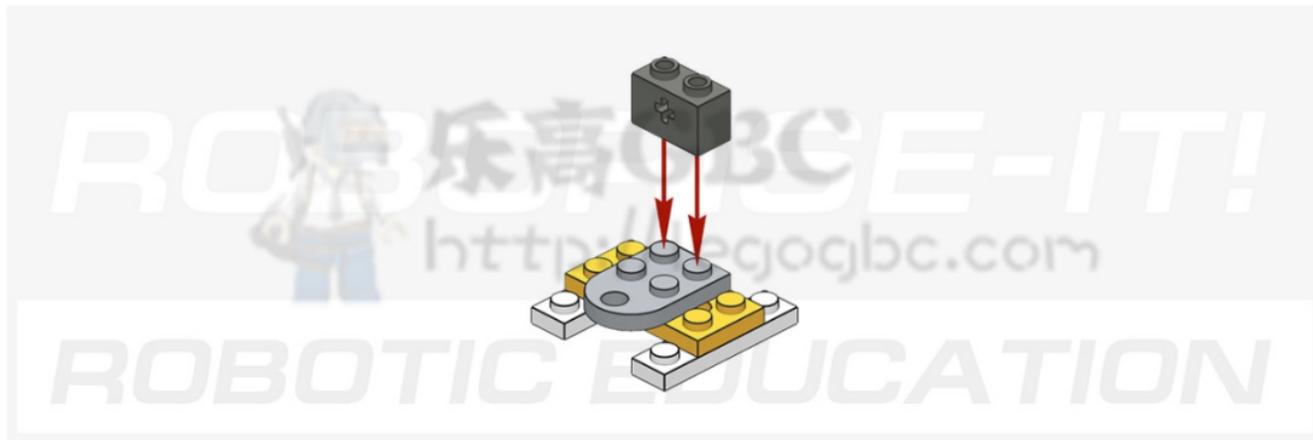


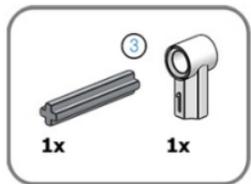
56



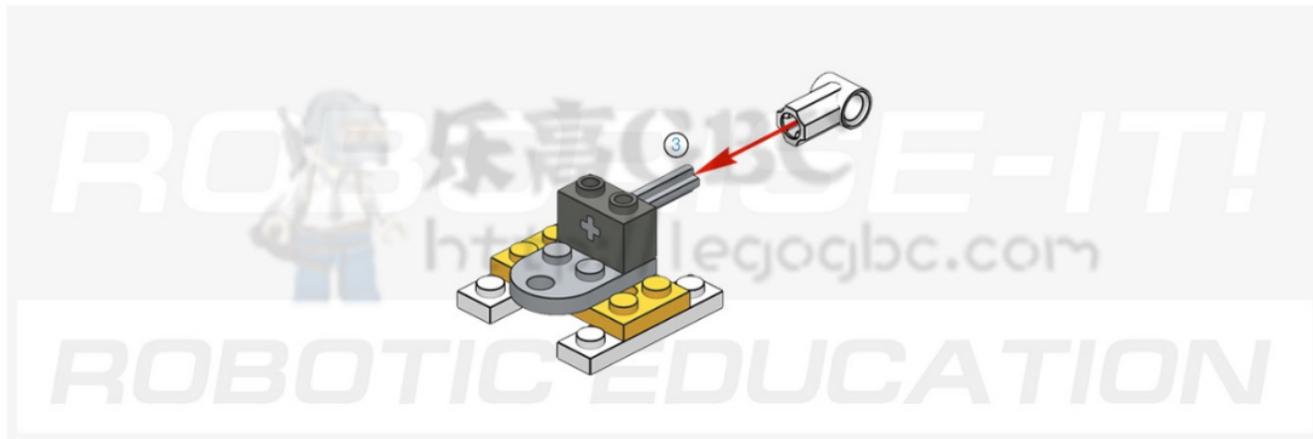


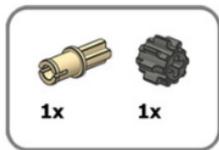
57



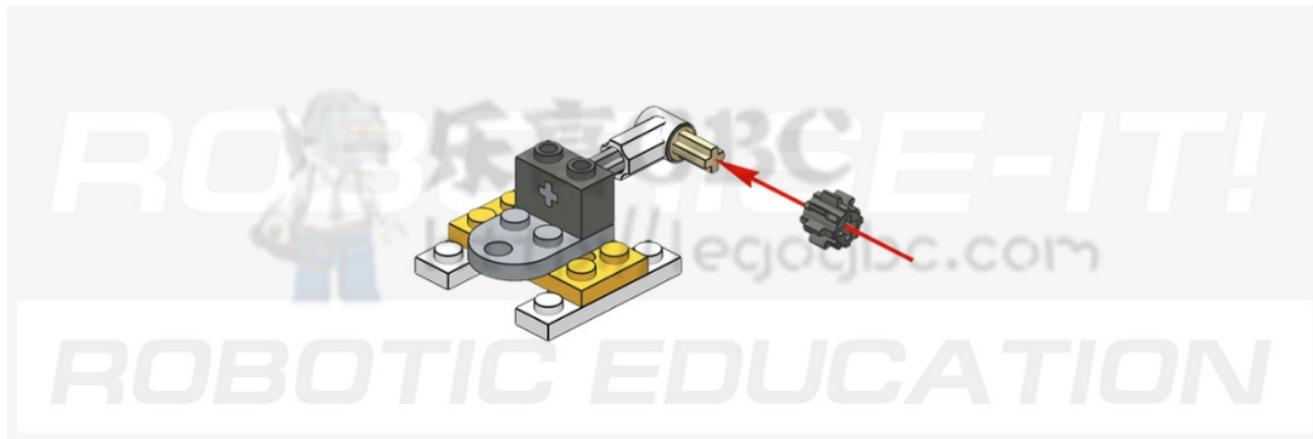


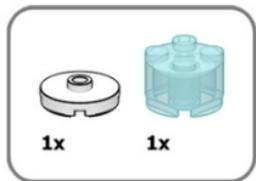
58



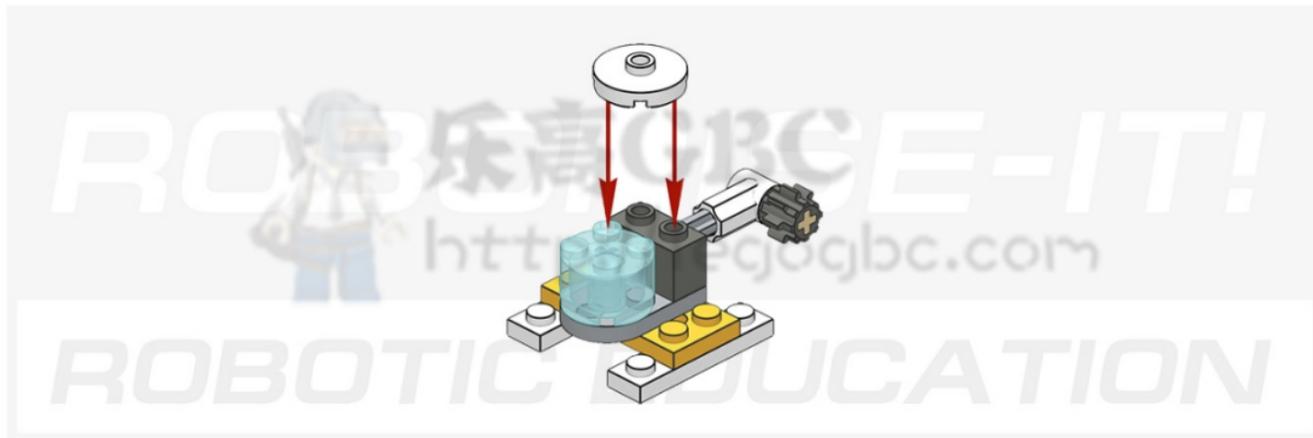


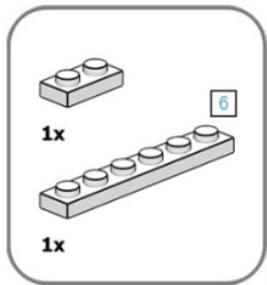
59



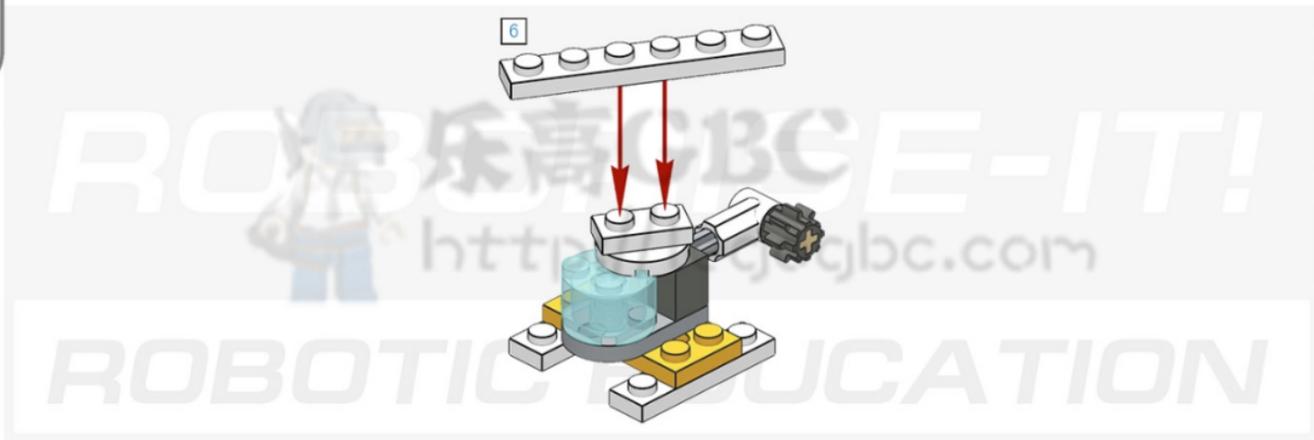


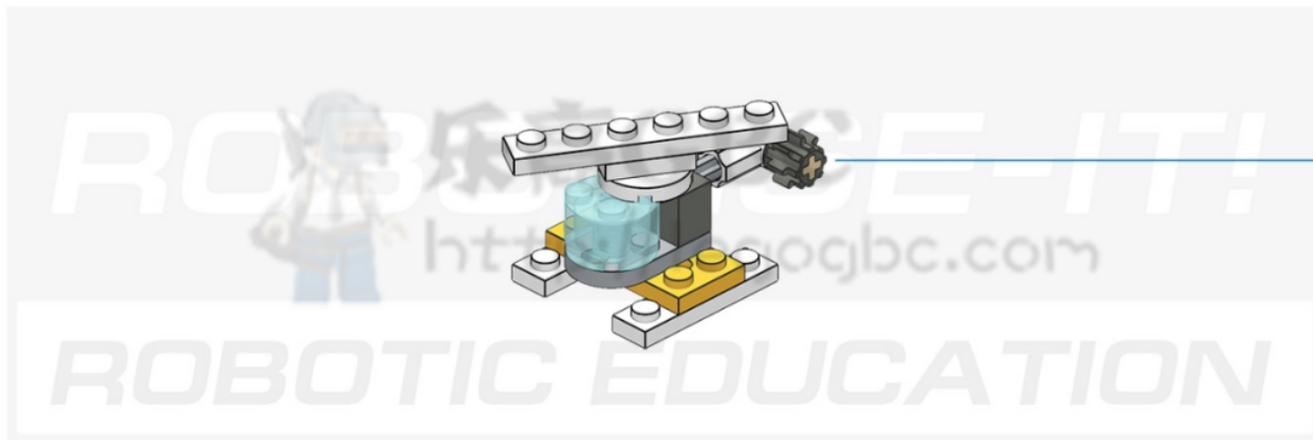
60



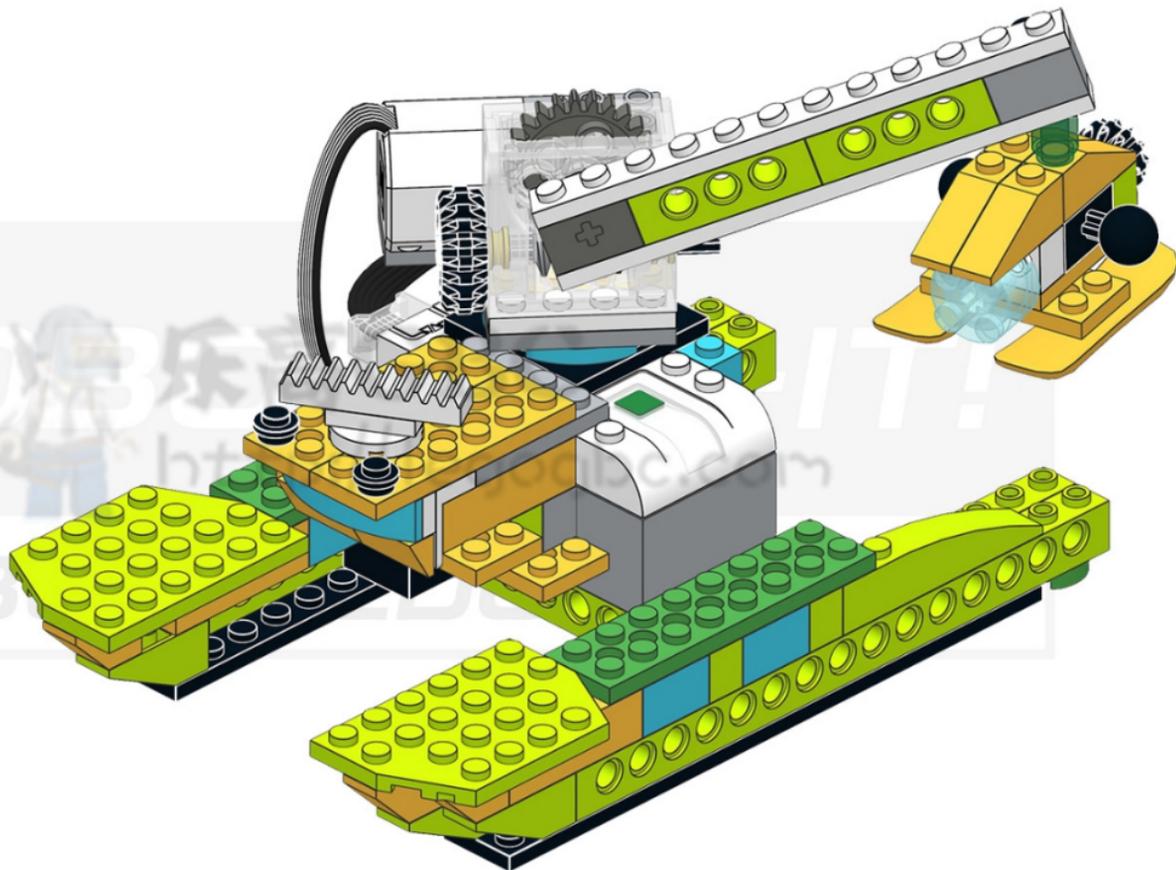


61





63





Note!



The cables must not rub while the robot is moving!





Task 1



Try to move your underwater drone from deck to water and pick it up after exploring the bottom.





Discuss!



乐高GBC

<http://legogbc.com>

**Examine the robot. Why does the lifting and lowering of the crane boom only work in manual mode?
How can this problem be solved?**



Design features

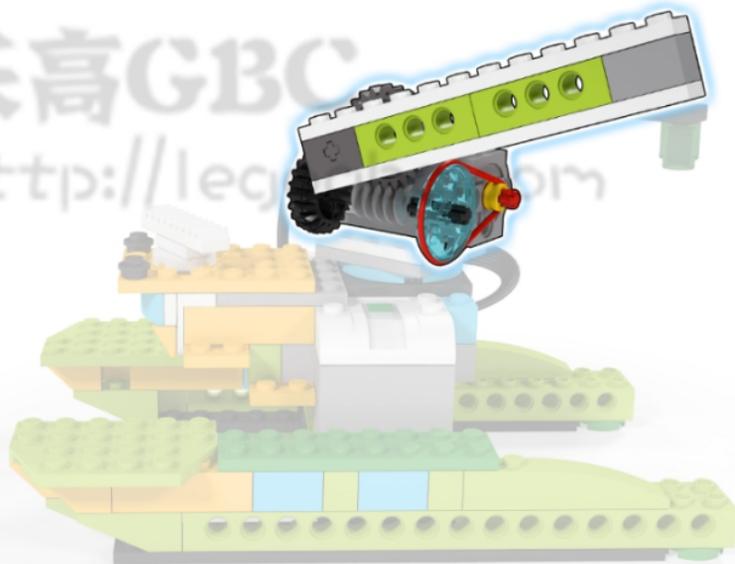


The worm gear significantly increases the force that the crane lifts. Therefore, it is better to use a belt drive in the drive, which will begin to slip when the crane jib is blocked.



Find:

- motor
- pulleys
- rubber belt





Task 2



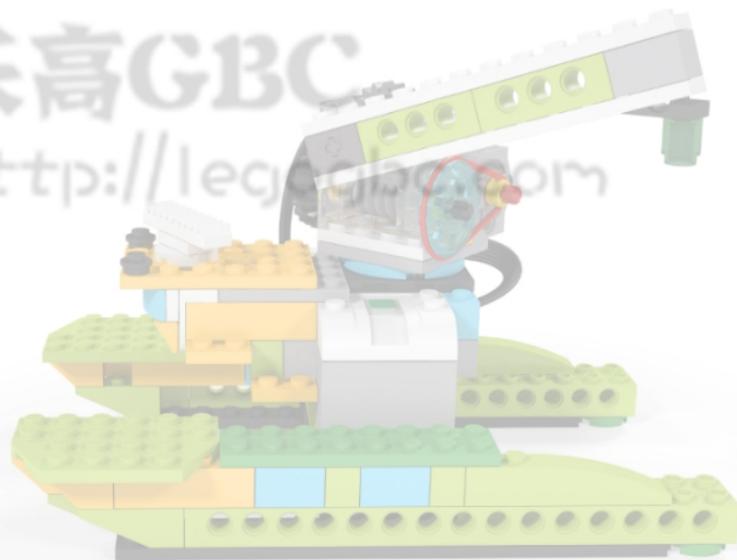
One possible solution is to use a belt drive. Install the pulleys and belt.





Tasks

Place the robot parts in the correct places





Task 3



Program the crane controls of the robot using the buttons. This will make drone manipulation much easier.





Task 3. Program



Scratch



WeDo Software



Program the crane controls using the buttons.

In the Scratch 3.0 programming environment, the program looks like this:

when **d** key pressed

- set motor direction to **this way**
- set motor power to **80**
- turn motor on for **2** seconds
- set light color to **20**

when **u** key pressed

- set motor direction to **that way**
- set motor power to **80**
- turn motor on for **2** seconds
- set light color to **80**



Task 3. Program



Scratch

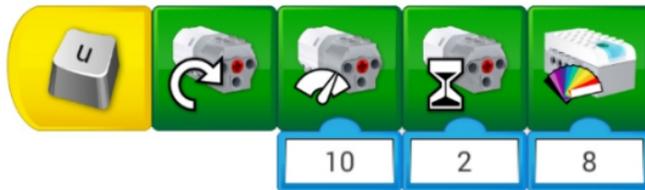


WeDo Software



Program the crane controls using the buttons.

In WeDo Software, similar programs look like this:





Discuss!



The programs you have written require constant monitoring of the current boom angle. If it is raised to the maximum angle, it is not advisable to turn on the motor for further lifting.

How can you make protection against too large angles of inclination up and down?



Task 4



Attach the tilt sensor to the crane boom. It will report the current tilt of the boom and the robot will be able to turn off the motor when it reaches critical angles.

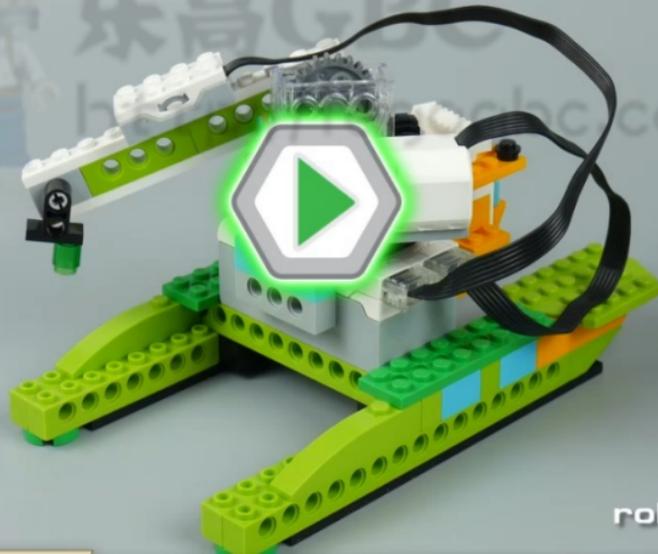




Task 5



Modify the programs you have written so that the robot turns off the motor when the boom reaches critical angles.





Task 5. Program



Scratch



WeDo Software



Modify the programs you have written as follows:

when **d** key pressed

set motor direction to **this way**

set motor power to **80**

turn motor on

wait until tilted **down** ?

turn motor off

when **u** key pressed

set motor direction to **that way**

set motor power to **80**

turn motor on

wait until tilted **up** ?

turn motor off

乐高GBC

<http://www.gbc.com>



Task 5. Program



Scratch



WeDo Software



Modify the programs you have written as follows:





Question



Which of the ships depicted is a catamaran?





Tasks



In which direction do you need to turn the handle in order for the crane to rise?



Check
answer





Question



Scratch



WeDo Software



Which of the software sides shown below will stop the motor when the sensor is tilted up?



```
when u key pressed
  set motor direction to that way
  set motor power to 80
  turn motor on
  wait until tilted up ?
  turn motor off
```

```
when d key pressed
  set motor direction to this way
  set motor power to 80
  turn motor on
  wait until tilted down ?
  turn motor off
```



Question



Scratch



WeDo Software



Which of the programs below will stop the motor when the sensor is tilted up?





Discuss!

- ▶ Why did the robot only have manual control of the crane?
- ▶ What gear did you use to fix the robot's transmission?
- ▶ What is a catamaran and what are its features?
- ▶ What equipment can a research vessel have?
- ▶ How did you implement the protection of the crane against too large boom angles?





Your achievements

Total:

0



1



2



3

8	2	2
---	---	---

```
when green flag clicked  
say hi for 2 secs  
say hi for 2 secs
```

4

