



STEM PLAYGROUND GRAND FINALE 2026

ROBOTIC ARM

Organised by



Supported by



Ministry of Education
SINGAPORE



ABOUT

The STEM Playground Grand Finale is back, bringing STEM learning and creative problem-solving to life! Participants will team up to brainstorm innovative ideas, tackle exciting challenges, and stand a chance to win attractive prizes. A brand new challenge awaits them in 2026!

TIMELINE

Milestone	Date
Registration Opens (Primary & Secondary)	15 July 2026 (Wednesday)
Registration Closes (Primary & Secondary)	30 October 2026 (Friday)
Prototype Completion in School*	Before Competition Day
STEM Playground Grand Finale (Primary)	17 November 2026 (Tuesday)
STEM Playground Grand Finale (Secondary)	18 November 2026 (Wednesday)

*Please refer to the **Design Specifications and Requirements** section for more details.

PROGRAMME DETAILS

Venue: Science Centre Singapore

Time: 9:00 am – 2:00 pm*

Date: 17 November (Primary) | 18 November (Secondary)

**The actual reporting time will be shared closer to the event date. Programme duration is approximate and the end time may vary depending on the flow of the event.*

Note:

- The Awards Ceremony will be held on the same day as the competition for each category (Primary and Secondary respectively).
- To enhance students' learning during the intervals of challenges, teachers may arrange additional activities by booking [ONE Ocean exhibition](#) through Online Booking System (OBS) under school programmes (at least 30 days in advance). Billing will be based on the actual attendance.



[https://for.edu.sg/stempgfinale2026r
egi](https://for.edu.sg/stempgfinale2026registration)

REGISTRATION

Scan the QR code or click on this link to
register for STEM Playground Finale 2026:

[https://for.edu.sg/stempgfinale2026regi](https://for.edu.sg/stempgfinale2026registration)

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CHALLENGE DETAILS

WHO CAN PARTICIPATE?

- **Suitable for:** Students from **Primary 3 to Secondary 5**
- **Team Composition:** Each team must comprise **4 members**
- **Competition Categories:** Primary and Secondary

Note:

- Each school may register **up to 8 teams, on a first-come, first-served basis.**
- Students from different levels may form a team, provided they are all from the same category (Primary or Secondary).

CHALLENGE FORMAT: PRIMARY & SECONDARY

PREPARATION (BEFORE CHALLENGE DAY)

- Form a team of 4 students and build your robotic arm prototypes in school.
- Teams may build multiple prototypes. **Select 2 of your best prototypes** to compete on Challenge Day (*Tip: Consider having different designs, such as hand/claw for gripping smaller objects and another for heavier loads*).
- Ensure your selected prototypes comply with the Design Specifications and Requirements.

CHALLENGE DAY

- After registration, teams will attend a mission briefing.
- Teams will head to the hall to present 2 selected prototypes for inspection.
- Teams whose prototypes do not meet the requirements will incur penalties.
- Upon successful inspection, teams will compete alongside other teams in Level 1 timed mission using approved robotic arms.
- Shortlisted teams from Level 1 will advance to Level 2 Mission.

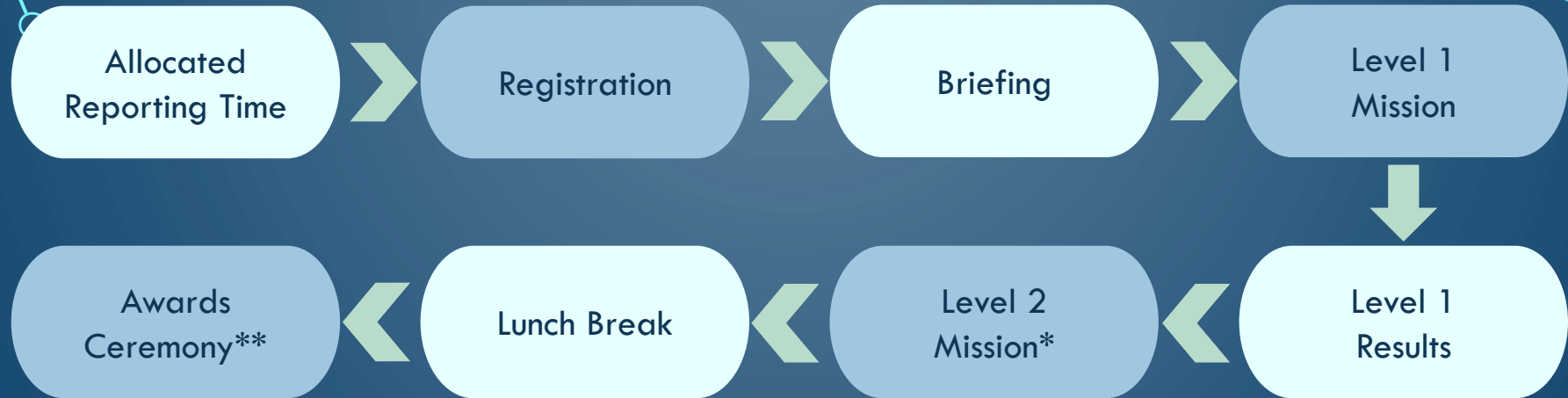
PLEASE TAKE NOTE

- ✓ **Bring along your own materials** that might be needed to touch up the robotic arm on challenge day (e.g., scissors, straws, cardboard, string, glue, etc.).
- ✓ The organisers will **NOT** be providing any materials on challenge day.
- ✓ Teams are required to bring their own completed prototypes to the competition. Teams that fail to do so **will not be permitted** to participate.

IMPORTANT:

Prototypes must be fully functional upon arrival on Challenge Day

CHALLENGE DAY FLOW: PRIMARY & SECONDARY



*Level 2 Mission is open only to shortlisted teams from Level 1.

****All teams are strongly advised to stay for the Awards Ceremony;** as special category prizes will be awarded to participants from both Level 1 & 2.

BONUS (POST-EXAM PROGRAMME)

- Sign up for our **Post-Exam Programme (PEP)**, running on weekdays from 12-22 October 2026, to get a **head start** at the STEM Playground Grand Finale challenge!
- As one of the PEP's key components, our hands-on STEM activity will equip your students with the skills they need for the challenge ahead.
- Register your interest for PEP [here](#)! Registration closes 9 September 2026.

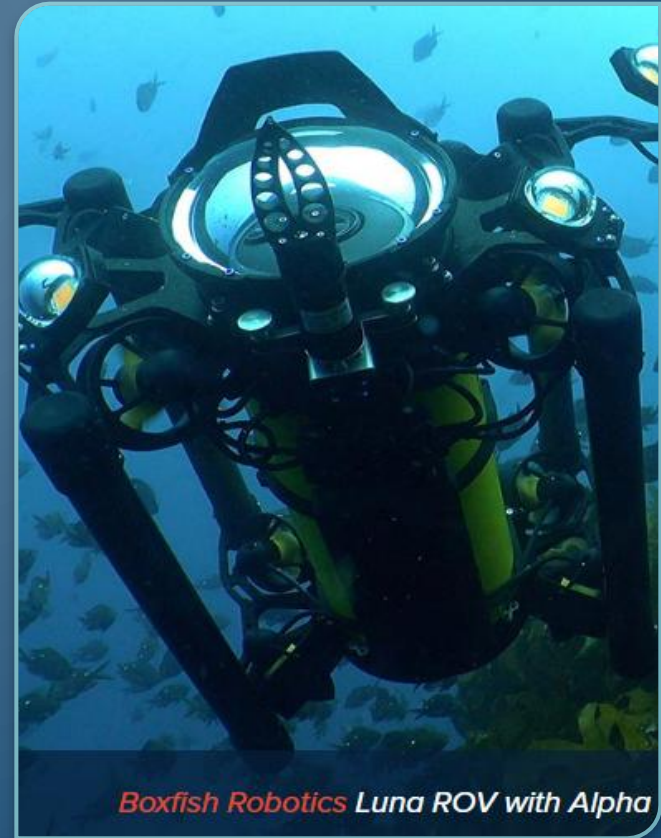
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THE CHALLENGE

UNDERWATER ROBOTIC ARMS: THE HANDS OF THE DEEP

The deep ocean is one of the most hostile and mysterious frontiers on Earth, where extreme pressures and darkness make human exploration nearly impossible.

Your team of 4 will be riding in a submarine, equipped with robotic arms, and embark on missions to uncover the secrets of the ocean.



BACKGROUND

Underwater robotic arms are important for four key reasons:

- **Deep-Sea Access:** Operate thousands of metres down, enduring immense water pressures to perform complex tasks where humans cannot survive
- **Fragile Marine Sampling:** Collect delicate creatures like jellyfish or corals without damaging them
- **Environmental Cleanup:** High dexterity to precisely snip and untangle abandoned "ghost nets" from fragile coral reefs
- **Archaeological Salvage:** Precision to safely lift historically valuable artifacts, from tiny coins to heavy treasures

EXAMPLE OF UNDERWATER HUMANOID ROBOT



Here is a real life sample replica of an underwater humanoid robot, OneOceanK, on a mission to retrieve samples from the ocean floor.

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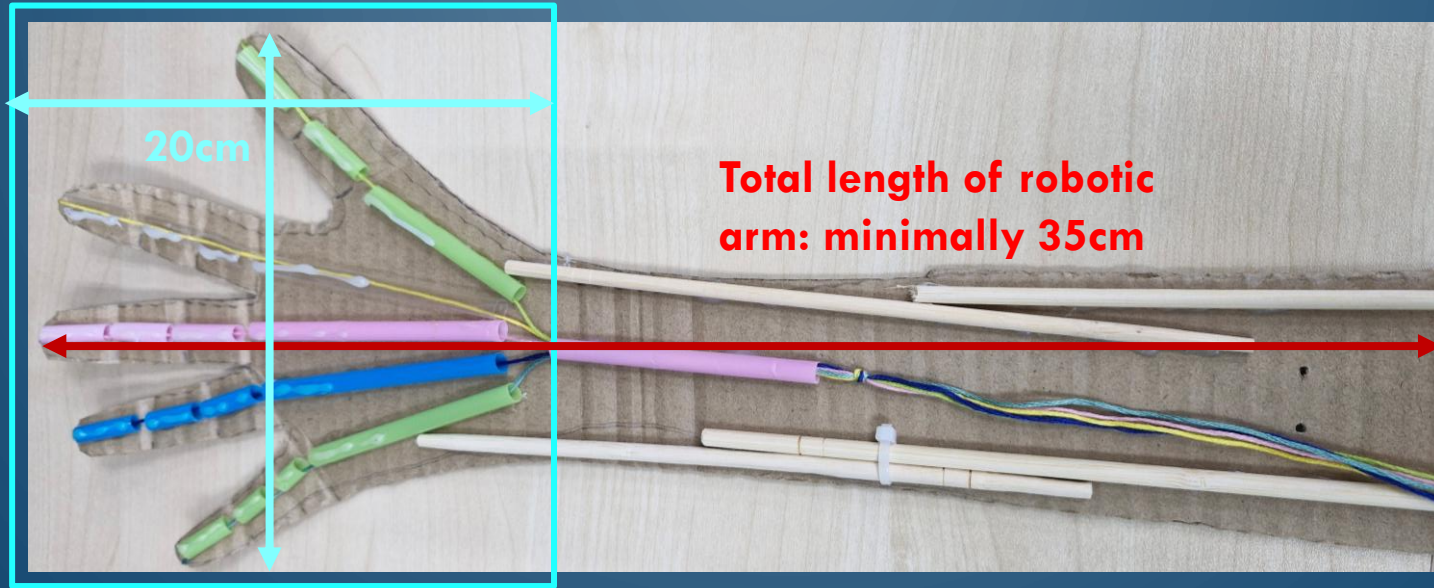
DESIGN SPECIFICATIONS AND REQUIREMENTS

DESIGN SPECIFICATIONS OF ROBOTIC ARM

IMPORTANT: Prototypes must be fully functional upon arrival on Challenge Day

- Teams may build multiple prototypes. Select **2 of your best prototypes** to compete on Challenge Day (*Tip: Consider having different designs, such as hand/claw for gripping smaller object and another for heavier loads.*)
- Total length of robotic arm: **minimally 35cm**
- Size of hand/ claw: **No larger than 20cm by 20cm** (when fully open)
- **Closing of the hand/claw should only be controlled by strings.** Hand/claw should be able to open once tension on the strings is released.

DESIGN SPECIFICATIONS OF ROBOTIC ARM



Total length of robotic arm: minimally 35cm

Controlled using string at the end of the arm

**Size of hand/claw:
No larger than 20cm by 20cm
(when fully open)**

DESIGN SPECIFICATION - MATERIALS

Entire prototype must be built from scratch

- Base of prototype must be made of **cardboard**
- Teams are strongly recommended to use recyclable materials (e.g., cardboard, string, plastic straws, chopstick, paper clip, toothpick etc.)
- Stapler & any form of adhesives are allowed e.g., white glue, hot glue, super glue, tape etc.

DESIGN SPECIFICATION - MATERIALS

Materials that are **NOT** allowed:

- 3D printed parts
- Laser cut parts
- Electronics
- Hydraulics (syringes and tubing)
- Metal screws, bolts or nuts
- LEGO/Technic series (or any other similar bricks/building toys)
- DIY STEM toy kits (and parts)
- Toys/grabber toys (and parts)



The image shows a collage of various materials and components that are not allowed, including 3D printed parts, laser cut parts, electronics, hydraulics, metal screws, LEGO bricks, and toys, all crossed out with a large red X.

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SAMPLE OF ROBOTIC ARM (HAND)

[Click here to watch sample video](#)

Parts of the robotic hand:



Straws: serves as the bones in the hands

Fold lines: serves as the joints for movement

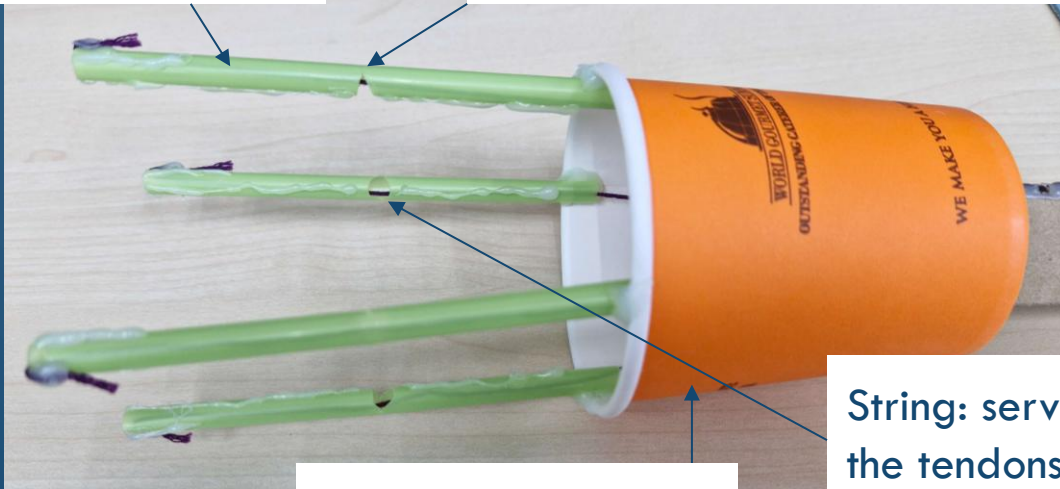
String: serves as the tendons to move the hand when pulled

Cardboard backing

SAMPLE OF ROBOTIC ARM (CLAW)

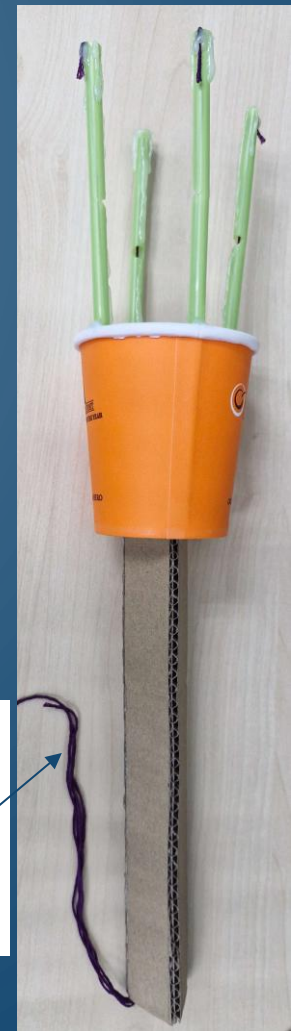
Straws: serves as the bones in the hands

V-shaped cuts on straws: serves as the joints for movement



Cup was used to hold the straws for a 3D shape

String: serves as the tendons to move the hand when pulled



REQUIREMENTS OF ROBOTIC ARM

Items that hand/claw should be able to grip:

- ✓ Size varying from 1cm to 7cm
- ✓ Cubic/spherical/irregular objects
- ✓ Maximum weight of 100g
- Teams will be standing at an arm's length from the items; hence robot arm must provide the extra reach (minimally 35cm) and items should be picked up from the side.
- Experiment with multiple designs and **select the 2 models that best fit your strategy** — for example, one optimised for small objects and another for heavier loads.

Tip: To improve grip, consider increasing friction at the contact points between the hand/claw and the object. Applying hot glue to contact surfaces or exploring other suitable methods can make a significant difference.

ROBOTIC HAND DESIGN IDEAS (FOR REFERENCE)



Simple, basic design

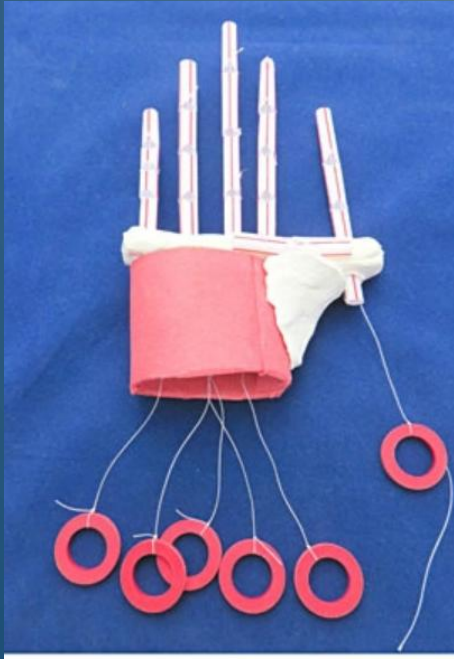
[Robot Hand STEM Craft - How to Make a Cardboard Robotic Hand](#)



With a holder and controlling individual strings

[Make a Mechanical Hand with Cardboard | DIY Robotic Hand Making #makersday #makerfun #diy](#)

ROBOTIC HAND DESIGN IDEAS (FOR REFERENCE)



[Make a Robot Hand Using Drinking Straws | Science Project](#)



[Robot claw using straws - Tripod grip](#)

ROBOTIC CLAW DESIGN IDEAS (FOR REFERENCE)

Rubber band
to hold the
claws open



Cardboard claw



3D claw

With rubber bands at the
back of the hands

ROBOTIC CLAW DESIGN IDEAS (FOR REFERENCE)

Claw design 1



Claw design 2



These designs are for reference only. You will need to **MODIFY** these designs to ensure:

- Closing of the hand/claw should **only be controlled by pulling strings**. Hand/claw should be able to open once tension on the strings is released.

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MISSION AND LEARNING OBJECTIVES

THE MISSION (PRIMARY & SECONDARY)

LEVEL 1: DEXTERITY TEST

Objective: Test of structural integrity & dexterity of your robotic arm.

The Task: Collect a variety of items of different difficulty levels.

Rule: Teams to operate two qualified robotic arms simultaneously.

Scoring: Points awarded based on the difficulty and number of items **successfully retrieved within the time limit.**

Open to **ALL participating teams**

LEVEL 2: RELAY

Objective: Test of teamwork & precision of handling robotic arm during the mission.

The Task: A relay-style mission requiring the team to work together on a series of tasks.

Rule: At any given time, only one team member may operate one qualified robotic arm.

Scoring: Points awarded based on the number of relay tasks **successfully completed within the time limit.**

For shortlisted teams that **advance from Level 1**

Please note:

- Full mission specifics will be **revealed on the Challenge Day.**

STEM LEARNING OBJECTIVES

1. Science (S)

The robotic arm mimics the movements of a human hand. Tension needed to change the mechanical shape of the hand/ claws, causing the fingers to close. Friction for an effective grip and elastic spring force of chosen materials for the hand/ claw to open.

2. Technology (T)

Students are introduced real-world marine exploration technologies (e.g. Remotely Operated Vehicles (ROVs) and Autonomous Underwater Vehicles (AUVs))

3. Engineering (E)

Students must work within the given constraints and systematically modify their prototype to improve dexterity, reinforce the frame and increase ease of operating.

4. Mathematics (M)

Ensuring accurate geometric measurements and symmetry can help to improve precision of robotic arm.

FAQ

1. Must each team have 4 members?

Yes, and all 4 members are required to contribute on challenge day.

2. How will the Post-Exam Programme (PEP) help our students at the STEM Playground Finale?

PEP includes a hands-on STEM activity that introduces concepts and skills relevant to the STEM Playground Finale, helping students prepare for the challenge ahead.

3. What should teachers expect after registering?

Upon successful registration, you will receive a confirmation email. Please ensure that all team members' names are spelt correctly, as these will be used for e-certificates. Your school's allocated reporting timeslot for Competition Day will be communicated approximately **one month before the competition**. No requests for timing changes will be accepted.

FAQ

4) Can my team bring multiple robotic arms on challenge day?

Teams may build and bring multiple robotic arms. On Challenge Day, teams may select **2 robotic arms** for inspection and use in the competition. Selected robotic arms must comply with the **Design Specifications and Requirements**. Robotic arms that do not meet the requirements will incur penalties.

5) Is attendance at the Awards Ceremony required for teams that do not qualify for Level 2 Mission?

We strongly advise all participating schools to remain for the Awards Ceremony. This final segment is a comprehensive celebration of student achievement across the entire competition. Beyond the top three placements, we have curated various Special Category Awards to recognise the technical dedication and creative problem-solving demonstrated by participants from **both Level 1 & 2**.

FAQ

6) How can students make use of the waiting time between challenges and the Awards Ceremony?

While waiting for the Awards Ceremony, students can complete the specially curated Gallery Trail by exploring the exhibition area and participating in the activities available at the holding area.

Teachers who wish to further enrich their students' learning experience may also arrange a **self-paid visit to the [ONE Ocean exhibition](#)**. Please refer to **Slide 4** for more details.



THANK YOU.

WE LOOK FORWARD TO SEEING YOU AT THE
STEM PLAYGROUND GRAND FINALE 2026!