

# GROVE ZERO STEM STARTER KITS

STEAM education | 21<sup>st</sup> century skills

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## the outlines

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- **Who and why need Grove Zero STEM Starter Kit?**

For Grove Zero, our mission is to make it possible and easy for 8-year-old children and up to exploration and create inventions, by using our sensors, LED matrix, and other modules. With the conveniently graphical programming software, we hope that programming skill and creativity will not be impossible or very difficult for students in elementary school.

We are surrounded by technology every day, this situation not only happens on adults, but also on children which born after 2010s. Most of children have ability to surf on the internet for search information, play video games with computers and mobile phones, and other electronic equipment, so that they already have the preliminary perception on “intelligence”. In order to cultivate talented people with core competencies in the future, “how to use it” should not be the key topic for our teaching, “how it works” and “how to create with it” will be more urgently problems.

Many teachers today were confused by the questions that how to develop students’ creativity, how to elevate their enthusiasm and initiative. There is an ongoing need to foster a collaborative culture of creativity, innovation, experimentation at a young age to encourage students to be interested in engineering as a necessary skill as a potential career field. We hope to support our learners with creative tools to expand the way they think about the world.

There are many technology products for educators, such as robots, LEGO, 3D prints, and so on. But how to choose the right and suitable things for the teaching and students is not easy.

Grove Zero combined the hardware and software to help students be freed to image and build and invent anything they want. The flexibility and adaptability of the bits mean students between primary school and high school, even professional makers or artists can use them to create very simple or very complex inventions. At the same time, we provide much learning materials for teacher’s teaching, it could help teachers to get the point on the curriculum, and reduce the preparing time for teaching.

- **Why the Grove Zero STEM Starter Kit valuable for students?**

The intention of the Grove Zero STEM Starter Kit takes away the difficulties that prohibit the average teacher from jumping into STEAM related activities. The modules and programming can be a perfect platform for students to develop higher-order thinking skills and learning goes beyond the lesson, which elevates them become not only intelligent consumers of technology but also inventors of the world around them.

➤ **STEM Education**

STEM education is an approach to teaching and learning that integrates the content and skills of science, technology, engineering, and mathematics. Grove Zero hold this approach through authentic and creative design exploration that cultivate hands-on learning about the scientific and mathematical world. The modules provide an opportunity for students to build innovative circuits that combine electronic building blocks with other materials, such as cardboard, color-paper, disposable cups, 3D printed objects. In this way, the projects and inventions could improve students' design thinking skills through drawing on the outward appearance and designing the structures. So that STEM combined with the ART subjects to be STEAM education.

Experimentation and playful thinking with Grove Zero produce unique and amazing outcomes, which can reach across many areas of the curriculum. In addition to learning about science and technology, students develop the design thinking skills which are important skills for engineers, then they learn to communicate their challenges through making speeches or writing down, that will elevate their sharing spirits.

### ➤ Project-based Learning

We recommend the project-based learning methods to integrate the innovation progress. The open-ended design possibilities give students an opportunity to innovate solutions to real-world problems for authentic learning that they can use to understand the world around them. As students work on projects with Grove Zero, educators can conduct formative assessments, prompt students to deeper thinking, and serve as a general resource for helping students develop content understanding. Students can use the modules and coding to create a project that demonstrates knowledge or learn a concept through the experience of creation with Grove Zero.

### ➤ Personalized Learning

We suggest educators to create opportunities for meaningful learning that takes advantage of natural curiosity about technology and utilizes the digital skills that most students already possess. In order to ensure the highest achievement possible, It customizes learning progress for each student's strengths, needs, and interests. Grove Zero allows educators to design challenges and projects that are more open and flexible than traditional models. Students can become more invested in designing their own pace and capitalize on their unique skills.

### ➤ Design Thinking

Design thinking is a process for problem-solving, students use Grove Zero to prototype solutions to authentic problems and implement design solutions. The modules and software are very easy to use, allowing students to come up with more sophisticated solutions as part of the design thinking process developed by Stanford University, in which students empathize, define, ideate, prototype, and test design solutions. Once students design and test prototypes, they may revisit the iterative design process to improve upon their designs and develop working prototypes.

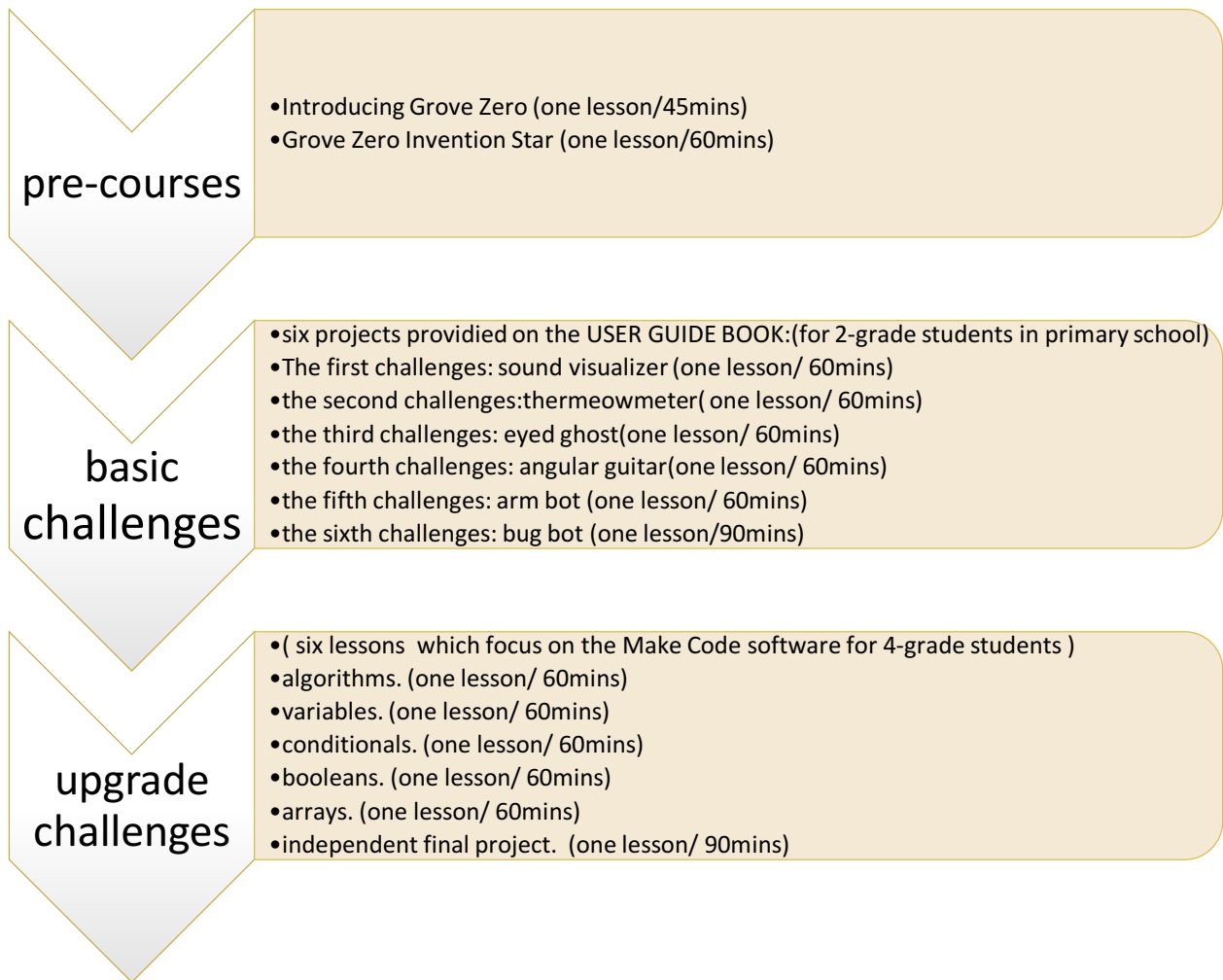
### ➤ 21<sup>st</sup>—Century skills

With a focus on authentic problem solving with technology and design thinking, Grove Zero Starter Kit helps students develop key 21<sup>st</sup>—Century skills for learning and career readiness. It could provide a natural environment for students to practice collaboration, critical thinking, communication, and creative design. These skills are important for today's students to survive in tomorrow's job market.

Although students can work on Grove Zero individually, our projects involve small groups that include 2-3 students. Collaboration is perhaps the most important 21<sup>st</sup>—Century skills, which is consistently mentioned as desirable for the company.

- How to use Grove Zero STEM Starter Kit in your classroom or your workshops?
  - a. If you are a teacher that teaches technology or science curriculum in elementary school, and you would like to initiate all your students in the class to learn and create with Grove Zero, we suggest you follow our teachers' guidebook starting your first ten-project journey. After that, the students will be familiar with the modules, that will be more comfortable for them to explore and create more different and amazing invention ideas.
  - b. If you plan to formulate a workshop opportunity for several students or novice teachers, the user guide book in the package of Grove Zero STEM Starter Kit maybe useful for you. The time for one workshop is between 90mins to 120mins that will be more suitable for exploration and create an experiment. There is an advised outline of a typical training for you:
    - The first step demonstrates the functions of each module. It's just playing with them, Students get to experience how the modules connect for complex circuits and functions.
    - The second step explores the projects that are shown at the user guide book, choose one or two projects to follow the steps and finish the building process. Including learning the module matcher software and make code software.
    - The third step is to design a new design challenge, students work as teams to come up with a special design challenge. Allowing very in-depth discussion on what aspects will produce the best challenge. There should have several minutes for brainstorm, and take out the detailed plan.
    - The fourth step is fabrication time, to create and prove their designs. Some of the students are responsible for the coding, some of them are in charge the structure of the invention, the other is management that keeps projects on the finished way. The division of work should be brief and suitable for the abilities of students.
    - The next step is projected debriefing and sharing. At the end of the class or workshop, students talk about the challenges and assess what has been happening and creating. It's important for students to talk and share their experiment, which responds of what they have learned and what confused them.
  
- Courses introduction and the outline of the projects

The purpose of our courses for Grove Zero STEM Starter Kit helps educators reducing the time to prepare their lesson. We provide more than 10 hours of lessons through 14 projects. The design of lesson is based on the students' ability and standards which have some criteria of good curriculum and teaching method. The difficulty of courses is gradually increase.



- **Typical features about our courses**

- a. **Encourage self-exploration**

Begin with play the modules without intentions, encourage student leading by the curiosity and imagination.

- b. **Contacting with reality experience**

Each project is based on the real life, which ignites students to think the real problems and create solutions. Such as the second challenges, on the stage of PLAY, some real questions were asked to students to make the temperature sensor contact with daily life, that will help students easier to understand the principle of the circuit.

- c. **Group cooperation**

Students will work in a group that includes 2-3 members for discussing, thinking, building the prototype, and upgrading inventions, that will improve students' the collaboration skills.

d. Continue creativity and imagination

With the invention star, the challenges don't be limited to create same works, even though we provide some templates for students to build the structures, but freedom will be shown on the design of the appearance. And the programming has not standard answer. If the effect can be shown to us, the program is success.

e. No right, no wrong for invention

Each of invention is worthy praised, the teacher should be generous to praise students about their creativity and experience.

f. Get through the classroom with extracurricular.

Invention has no define the time and the place, we hope students has enthusiasm to invent some new things with Grove Zero, the class maybe just a place for teamwork or answering questions, but the thinking and innovation should be stopped after class.