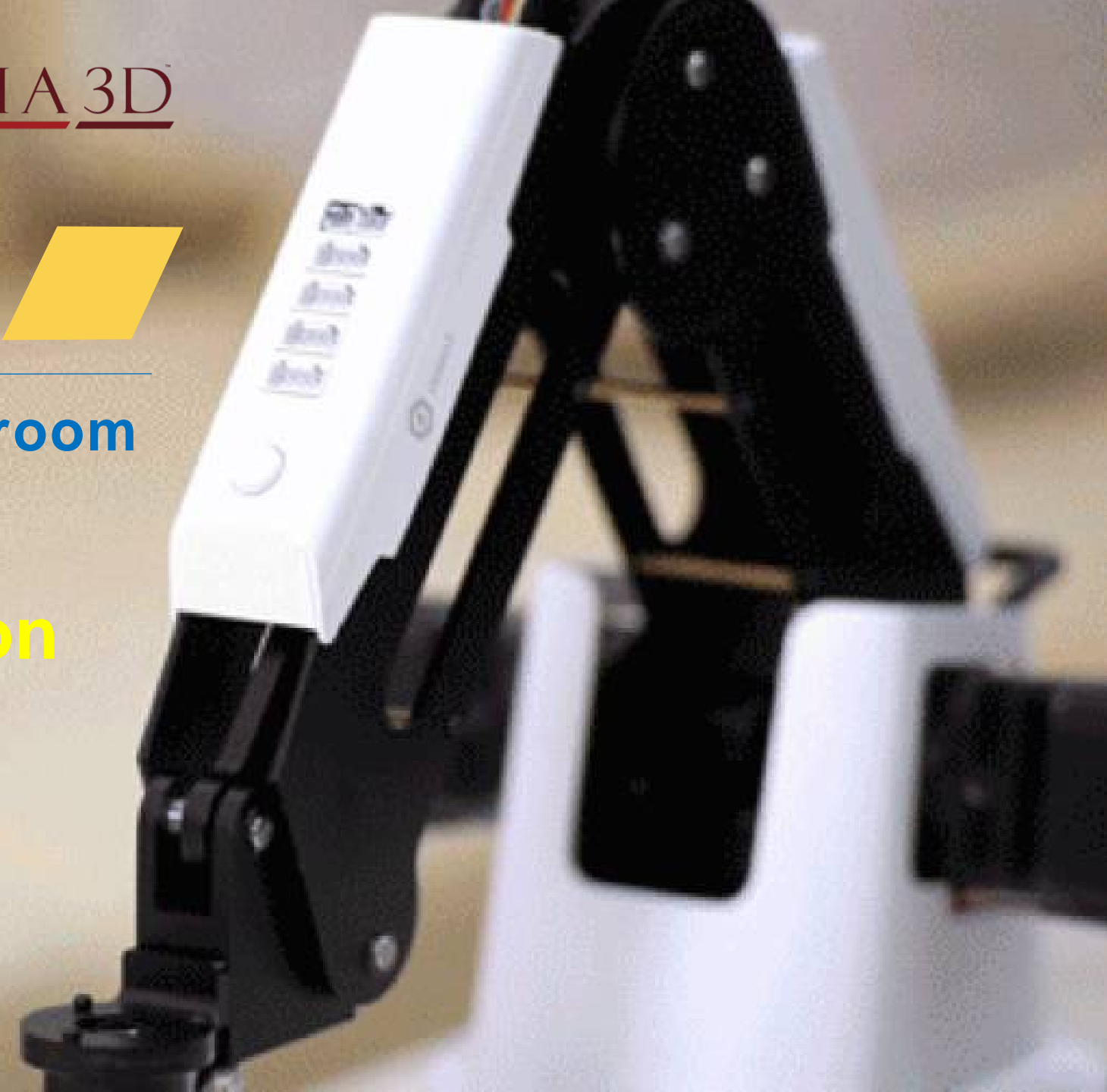




Dobot manipulator

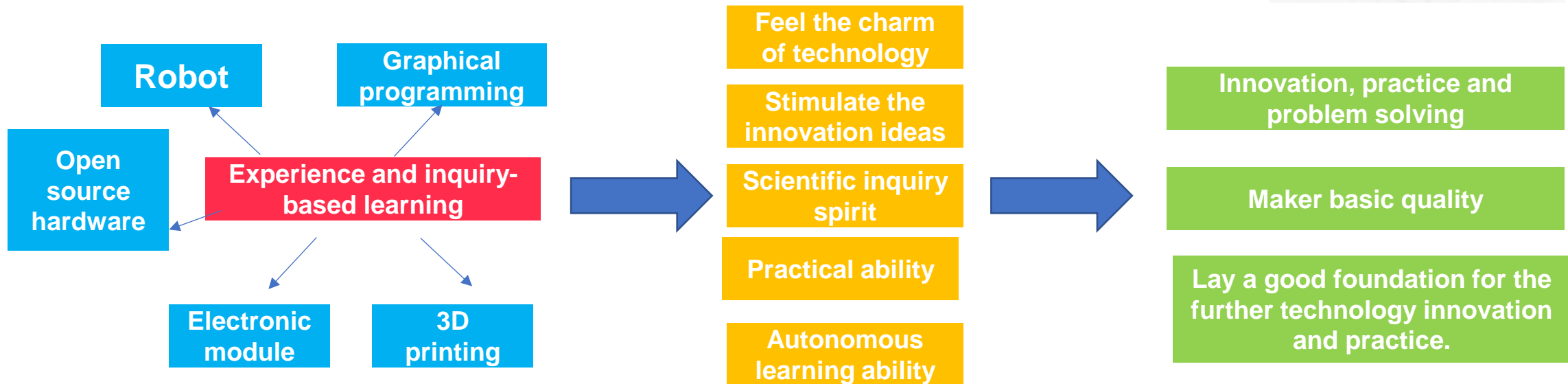
Maker experimental classroom

Course introduction



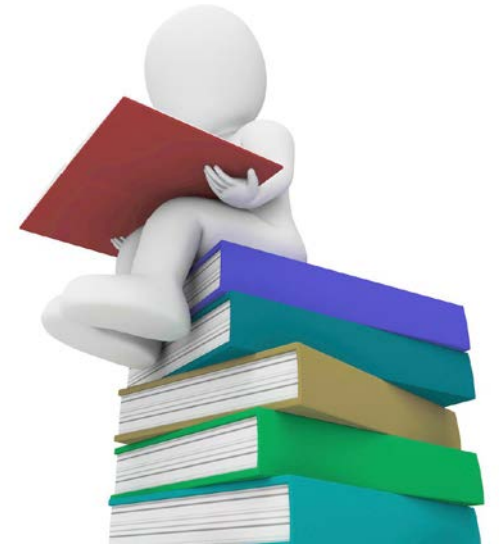
Course objective

Take Dobot Magician manipulator as the carrier, help the students understand the knowledge about the leading technology in terms of robot, open source hardware, graphical programming, electronic module, 3D printing, etc., and feel the charm of technology through the rich experience and inquiry-based learning of the manipulator, stimulate their innovation ideas, cultivate their scientific inquiry spirit and practical ability and autonomous learning ability, enable the students to have the maker basic quality regarding innovation, practice and problem solving, so as to lay a good foundation for the further technology innovation and practice.



Course content

Understand the structure and principle of Dobot Magician manipulator, take the exploration of theme as the main form of learning, and in combination with the manipulator kits and external electronic modules, experience the functions of the manipulator such as gripping, pick-up, writing and drawing, teaching playback, 3D printing, etc.; have a preliminary understanding of graphical programming, design a program to achieve the specific function of the manipulator, and design an interactive device in combination with external electronic modules to achieve specific applications; collaborate on by-group basis to play creative and practical ability, and participate in the final manipulator skills competition using the knowledge learned.



Basic principle of robot

Writing & drawing, handling object, sucker control

Graphical program and robot control

Systematic learning from 0 to 1

Feel multiple control methods and experience the fun of technology

**Multiple development application
Teach through lively activities**

**Visible and touchable
Learn programming easily**

**From module to system
Achieve mastery through a comprehensive study**

Dobot manipulator maker experimental classroom

- Targets: junior school or above students.
- Basic requirements: basic computer skills.
- Course structure: three teaching modules + final competition

Manipulator introduction
and Dobot experience

DobotBlockly
Graphical programming

Comprehensive
development application

Manipulator skills
competition

- Classhour: 16 classhours, 60min/classhour, flexible development, meet the requirements for the semester.
- Difficulty: ★★ Experience: ★★★★★ Interest: ★★★★★

Detailed teaching plan, easy to use,
Provide the complete slide and the student handbook, no threshold for maker education.

Detailed introduction of course sections

Course arrangement – four modules

Section I Manipulator introduction and Dobot experience

Understand the basic structure, connection and debugging method of the manipulator, get familiar with operation of DobotStudio, use various kits of the manipulator to complete different connection and operation modes of the manipulator, learn to control the manipulator to write and draw and handle the objects with the help of mouse or handle, and achieve individual creation.

Section II DobotBlockly Graphical programming

Learn programming through the graphical mode, understand basic function modules and logics for programming, and learn to achieve the manipulator control and individual creation with the help of graphical programming.

Section III Comprehensive development application

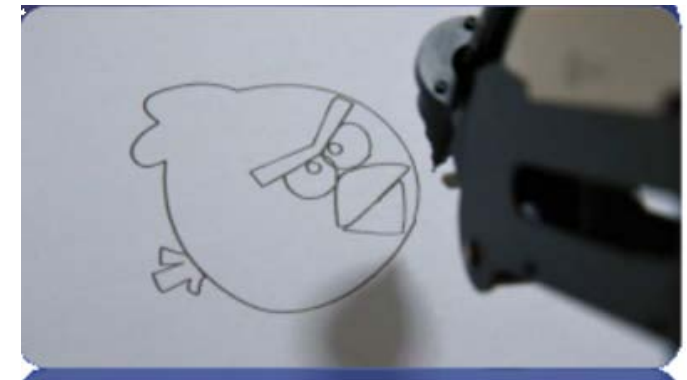
In combination with the graphical programming, understand basic knowledge about electronic module, and based on different electronic modules, complete the comprehensive development application of the manipulator.

Section IV Manipulator skills competition

Collaborate on by-group basis to play creative and practical ability, and participate in the final manipulator skills competition using the knowledge learned

1. Manipulator introduction and Dobot experience

- 1.1 First experience of Dobot manipulator
- 1.2 Handle control and teaching playback
- 1.3 The manipulator plays with literary skill
- 1.4 Good play with 3D printing (Part I)
- 1.5 Good play with 3D printing (Part II)



1. Manipulator introduction and Dobot experience

Lesson 1 First experience of Dobot manipulator

Understand the basic structure of the manipulator, the scope of the movement and its coordinate axis structure; get familiar with the interface and function of DobotStudio, and master the method of connecting Dobot to the computer; master the installation and operation method of air pump and sucker kit; master three control modes of the mouse control manipulator. Classroom exercise: handle the building blocks.

Lesson 2 Handle control and teaching playback

Master the installation and operation method of the gripper kit, and have the ability to handle the objects with the gripper; master the installation and operation method of the handle kit, and have the ability to control the manipulator in two modes with the help of the handle; master the operation of "Teaching playback function, and have the ability to handle the objects in combination with the gripper kit. Classroom exercise: the game of building blocks

Lesson 3 The manipulator plays with literary skill

Master the installation and operation method of writing kit; skillfully operate the manipulator for writing & drawing; master the method of importing the patterns via DobotStudio for drawing. Classroom exercise: control the manipulator to write and draw + import the pattern for printing.

Lesson 4 Good play with 3D printing (Part I)

Understand the basic principles of 3D printing; master the installation and operation method of 3D printing kit; master the steps and methods to print 3D model with the manipulator. Classroom exercise: use the manipulator to print a simple 3D model.

Lesson 5 Good play with 3D printing (Part II)

Through the introduction of the 3DOne model design software, let the students learn the basic operation of the software and use some basic functions to design a simple 3D model; learn to operate independently from design to print by themselves and print out 3D model designed by themselves with the help of the manipulator. Classroom exercise: print a twisted pen container.

2. DobotBlockly graphical programming

- 2.1 Start of graphical programming
- 2.2 Automatic cycle stamp
- 2.3 Domino building
- 2.4 Unplug the charger at the setting
- 2.5 Music play



Logic
 Loops
 Math
 Text
 Lists
 Colour
 Variables
 Functions
 DobotAPI
 Basic
 Config
 Motion
 I/O

```

set Start time to GetTime
print "Start time: "
print Start time
set The seconds of the setting time to 10
set Implementation time to Start time + The seconds of the setting time
print "Implementation time: "
print Implementation time
set The current time to GetTime
repeat while The current time < Implementation time
do
  set The current time to GetTime
  print "The current time: "
  print The current time
  print "The seconds of the implementation time: "
  print Implementation time - The current time
  Unplug the charger
  print "Unplug the charger complete"
      
```

to Unplug the charger

Chose End Tools Gripper

Gripper Release

Jump To X 250 Y 0 Z -15

Delaytime 1 s

Gripper Gripper

Delaytime 1 s

Jump To X 150 Y 0 Z 15

Gripper OFF

2. DobotBlockly graphical programming

Lesson 6 Start of graphical programming

Master basic knowledge of graphical programming; get familiar with Blockly graphical programming interface; achieve preliminary understanding of the basic functions of the functional modules of Blockly; attempt to write the program and achieve the handling of simple objects using the graphical programming module; get familiar with the general steps of programming, and develop a good programming habit. Classroom exercise: write a program to achieve the handling of small objects by the manipulator.

Lesson 7 Automatic cycle stamp

Write a program using the graphical programming module and realize the loop execution of a task by the manipulator, learn the structure of cycle of the specified times, the nested structure, function definition and call. Classroom exercise: write a program to achieve the function of automatic stamping by the manipulator.

Lesson 8 Domino building

Achieve the manipulator's automatic building of domino of a simple shape by virtue of the graphics module programming, and learn the assignment of variables and the implementation method of variable increment and functional modules as mathematical operation, the cycle structure of the specified step, movement to point, etc. Classroom exercise: write a program to achieve the automatic building of Dominoes by the manipulator.

Lesson 9 Unplug the charger at the setting time

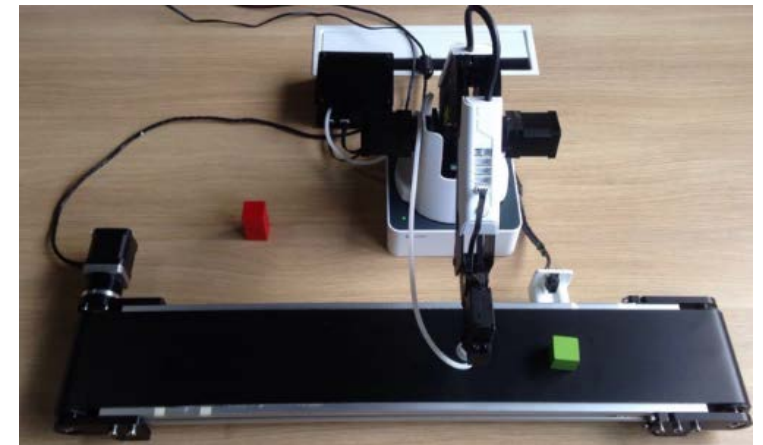
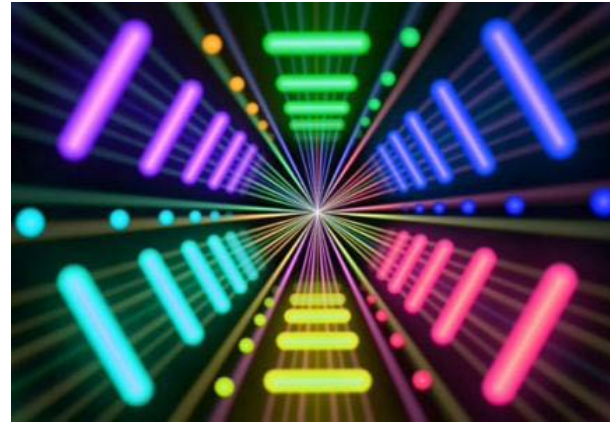
By virtue of the graphical programming module, wire a program to achieve the manipulator's automatic execution of a task at the setting time, learn the access and logic judgment of the system time, the functions and operation method of such modules as "when cycle / till cycle" structure, printing, etc. Classroom exercise: write a program to achieve the manipulator's automatic unplugging of the charger at the setting time.

Lesson 10 Music play

Write a program to achieve the manipulator's playing music automatically on the keyboard with the help of the graphical programming module, and develop the ability of comprehensive application of the functional modules such as variable, function, mathematical operation, manipulator movement, cycle at the specified step cycle, time delay, etc.

3. Comprehensive development application

- 3.1 Flashing LED light
- 3.2 The sensitive intelligent light
- 3.3 Stamping on the pipeline
- 3.4 Stack objects on the pipeline



3. Comprehensive development application

Lesson 11 Flashing LED light

Learn the basic knowledge of electronic circuit, get familiar with the manipulator interface function and operation method, write a program to achieve LED light flashing function through connecting the manipulator interface with external LED light and buzzer, experience the manipulator external module application, and complete the comprehensive application start of the manipulator. Classroom exercise: design a flashing LED light.

Lesson 12 The sensitive intelligent light

Master the function and operation method of the manipulator interface, learn the connection and operation of the light sensor, write a program to read light change value, achieve the LED light-up when the lighting is below a certain value, and experience the design process of the interactive device. Classroom exercise: design a sensitive intelligent light.

Lesson 13 Stamping on the pipeline

Learn the application of the manipulator in combination with pipeline, get familiar with the pipeline connection and debugging method, and master the pipeline control method and the steps to complete the work task together with the manipulator. Classroom exercise: design a program in which the manipulator stamps the files on the pipeline automatically.

Lesson 14 Stack objects on the pipeline

Master the pipeline control, write a program to achieve the application of stacking objects by the manipulator in combination with the pipeline, review the functional modules such as variables, mathematical calculation, cycle structure, develop the comprehensive competence, and experience the operation of stacking objects on the pipeline. Classroom exercise: design a program in which the manipulator stacks the objects in combination with the pipeline.

4. Manipulator skills competition

- 4.1 Competition plan & pre-competition exercise

Lesson 15 Competition plan & pre-competition exercise

Review the content of the manipulator courses in this semester, consolidate the learning results, and answer the questions; introduce the items and process of the manipulator skills competition, and complete the students competition by groups; ask the students to discuss the competition, allocate the members responsible for all links, get familiar with the competition process, do the necessary preparation or exercise.

- 4.2 The manipulator skills competition

Lesson 16 The manipulator skills competition

Cooperate on the by-group basis to give a full play of creation and operational ability, and participate in the manipulator skills competition based on the knowledge and skills learned; Summarize the learning experience in the semester, and complete the manipulator courses successfully.



Course characteristics

- Follow the STEAM maker education concept, and integrate the multidisciplinary knowledge in the course

Help the students understand the multidisciplinary field through the course learning, encourage the students' development and improvement in science & technology, engineering and mathematics, and develop the comprehensive qualities of the students.

- Pay attention to experience and interaction, and help the students learn while playing

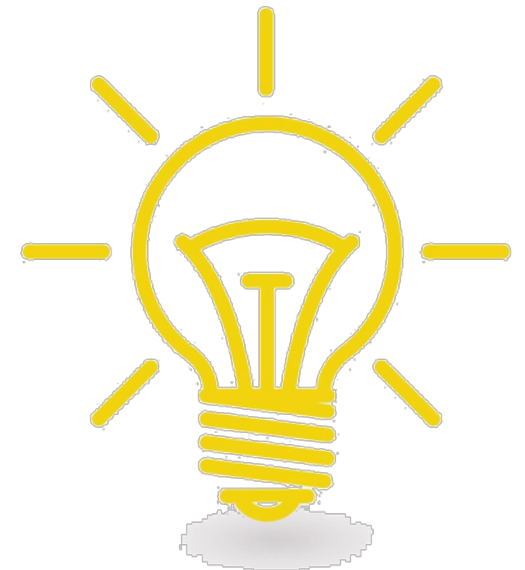
Different from the traditional teaching method, maximize the learning interest of the students, and the knowledge starts from practice.

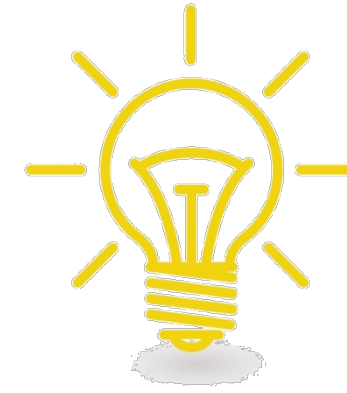
- Theme-based teaching, switch from "I am wanted to learn" into "I want to learn".

Guide the students to explore knowledge in specific situation, and improve the students' desire to explore and cultivate their learning initiative.

- Encourage independent research and innovation, and focus on the combination of theory and practice.

Provide the students with independent research such as various classroom tasks, competitions, after-class exercises, the final team project competition and so on, and provide sufficient creation space for the students.





Education concept — teaching method

- **STEAM maker education concept**

Follow the STEAM maker education concept, help the students understand the multidisciplinary fields such as science & technology, engineering and mathematics, art, etc., and develop the comprehensive qualities of the students.

- **Inquiry-based teaching**

Various inquiry activities help the students learn while playing, switch from "I am wanted to learn" into "I want to learn", pay attention to experience and interaction, and maximize the learning interest of the students.

- **Project-based teaching**

Through the project setting, guide the students to explore the knowledge by themselves, complete the task based on the knowledge learned and the existing resources, and improve the students' desire to explore and cultivate their learning initiative

- **Practice method**

At the same time of presenting the theoretical knowledge, pay attention to the practice, design the practical activities of various links on the class, test the theory in practice, and practice the real knowledge.

- **Teamwork**

The course focuses on developing the ability of teamwork, design a variety of tasks which are to be completed through the discussion and coordination between the members, encourage the development of individual expertise, mutual learning and common progress.

- **Immediate feedback**

Complete the task on the class, have a real-time tracking of the students' mastery progress of the content, design the questions according to the knowledge points, and improve the feedback mechanism to timely find the students' questions and give answers.



THANK YOU

