

The First World Vocational College Skills Competition

Competition Rules

I. Name of the Skill

No.: W05

Chinese name: 无人机维修与应用

English name: Reparation and Application of UAV

Industry: Equipment manufacturing industry

II. Competition Purpose

The World Vocational College Skills Competition aims to bring together standards, technologies, equipment, teachers and students in the field of vocational and technical education at home and abroad, adhere to promoting Chinese vocational education to go global and serve international cooperation in production capacity, build an important platform for teachers and students of international vocational schools to deepen friendship, exchange skills and show styles, and promote the construction of a world community of skills. Through skills competition, demonstration and experience exchange, it is expected that the best practices of international vocational and technical education could be shared, the influence of Chinese vocational and technical education in the world in this field could be enhanced, and China's vocational and technical education could be further aligned with global vocational and technical education.

UAV has been paid great attention to by countries worldwide as a cutting-edge and interdisciplinary technology highly integrating aviation and IT.

With the development of technologies, the application scope of UAV has been extended. From initial military purpose to current civil purpose, UAV application has increasingly become mature in such industries as consumption, plant protection, power, security protection and mapping. Service staff engaging in UAV installation and configuration, debugging and after-sales maintenance will still be indispensable in the long term. The UAV Repairation and Application Skill Competition in the First World Vocational College Skills Competition (the "Competition") will advance the development and teaching reforms in majors related to equipment manufacturing, UAV application of electronics and information disciplines and UAV mapping in vocational schools. The Competition aims to cultivate high-quality, technical and skilled professionals undertaking UAV production and assembly, general assembly and debugging, maintenance, UAV control and intelligent applications and development, actively respond to the state's strategy for cultivating skilled talent, and develop a good trend and pattern of "promoting education and production by competition, integration between industry and education, and coordinated development".

III. Competition Content

The Competition focuses on testing the knowledge and skills of competitors in rotor UAV configuration selection, assembly and debugging, flight control and application development based on visual recognition. It is required that competitors should be capable of skilled operation concerning rotor UAV configuration selection, part installation, electrical connection, functional

debugging, operation and maintenance, flight control and secondary development, innovations in technologies, application and analysis and comprehensive professionalism.

The Competition duration is five hours. Teams should complete the three Competition tasks within the specified time, in the form of on-site operation, according to the relevant materials and Competition Test Project ("TP") provided in the venue. Competitors should determine their respective work allocation based on tasks. The content and marking weights for each part of the Competition are as follows:

i. UAV assembly and debugging, with a mark weight of 40%. In accordance with the requirements of TP, competitors should complete the design, assembly and debugging of rotor UAVs by leveraging the provided UAV components, and equipment, tooling and tools. For UAV power, control, communication, take-off and landing and loading systems, competitors should utilize corresponding software to complete the debugging of sub-systems meeting the flight criteria and implementing functions of object grabbing, transportation and designated drops required by the TP.

ii. UAV flight control, with a mark weight of 20%. In accordance with the requirements of TP, competitors should control UAV with remote controllers in the flight validation workshop, complete the take-off at the take-off and landing sites, and grab items at designated sites. In addition, they should operate UAV to pass obstacles along the specified routes, complete object drops at the designated

areas, land on the takeoff and landing sites safely, and accomplish other specified operation.

iii. UAV application and development, with a mark weight of 30%. In accordance with the requirements of TP, competitors should fulfill the flight functions of automatic whole-process tracking and monitoring of UAV through the utility of the provided secondary development platform, and parameter debugging and functional calls of visual sensors.

iv. Professionalism and consciousness of safety, with a mark weight of 10%. In the on-site Competition venue, professionalism, for instance, team organization and management, team synergy, working efficiency, quality and cost control, and rules and programs and consciousness of safety will be examined.

v. Additional tests, with the mark set as ten points. A presentation platform will be offered for teams or a competitor with extraordinary skills. Specifically, in accordance with the requirements of TP, after completing the specified Competition tasks, competitors can select the Competition tracks with considerable difficulties to control their UAV by leveraging remote controllers to complete the designated flight tasks within the overall time.

IV. Competition Method

i. Team formation

1. The mode of "0.5+0.5" hand-in-hand Chinese-foreign mixed team (hereinafter referred to as "mixed team") is adopted which consists of three

Chinese-foreign competitors, and at least one foreign student should be included. Competitors should sign up, compete and win prizes in teams.

2. Domestic competitors must be full-time enrolled students from higher vocational colleges, as well as vocational education undergraduate colleges.

3. Foreign competitors must be foreign full-time students in related majors of vocational schools or colleges and universities providing vocational education, and international students of undergraduate schools in China are also encouraged to participate.

4. Competitor replacement: If a competitor is unable to participate for any reason during the preparation, the relevant department should issue a written explanation ten working days before the start of the corresponding Competition. The competitor will be replaced after verification by the office of the Executive Committee. After the Competition starts, the team is not allowed to replace the competitor.

ii. Competition methods

The Competition will be conducted in the forms of on-site Competition + recorded broadcast. Domestic competitors will compete on site; if foreign competitors are unable to attend the on-site competition, they will compete through recorded broadcast. Foreign competitors must send the Competition videos that meet the requirements to the mailbox designated by the Executive Committee of the Competition ("Executive Committee") seven days before the official Competition day, and the Executive Committee will check and try to broadcast the videos and seal them for records in a uniform manner. On the official competition day, the videos should be unsealed by the jury, and those

from the foreign competitors should be broadcast on the big screen on site. The marking criteria should be the same as those for on-site competition. Requirements for Competition videos: The file format is MP4; the resolution is no less than 1280 * 720, the recommended aspect ratio is 16:9, and the video content needs to fully display the Competition process.

V. Competition Process

i. Competition time

The overall Competition lasts for five hours. The Competition is divided into two phases. Phase I is to complete the Competition tasks for UAV assembly and debugging and flight control with the duration of three hours; Phase II is to complete UAV application and development with the duration of two hours. Additional tests must be voluntarily selected after the completion of the above tasks. Each team should complete the Competition task independently during the specified time period.

Start and end times of the Competition: 9:00-12:00 and 13:00-15:00 on the Competition day, among which 12:00-13:00 is the unified time for lunch, with the Competition content concluded at 15:00.

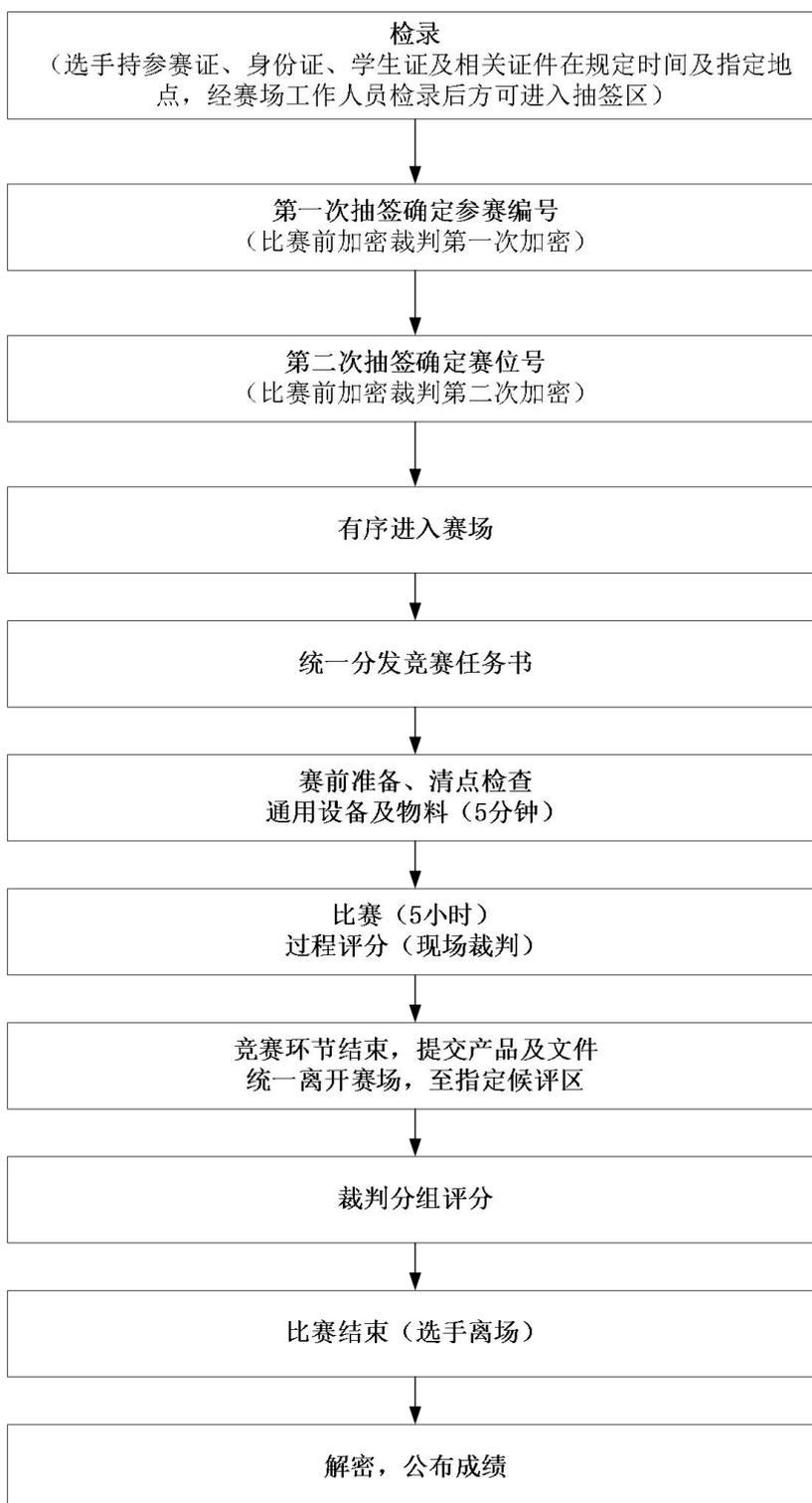
ii. Competition Process Flow Chart

Table 1 Competition Timeline and Flow Chart of UAV Assembly and Debugging and Application

| Date | Time | Milestone |
|--------------------------------|---------------|---|
| One day before the Competition | 07:00 – 14:00 | Teams complete their check-in and registration |
| | 14:30 - 15:30 | A Competition briefing will be held for team leaders and competitors during which the check-in numbers will be drawn. |

| | | |
|-------|---------------|---|
| | 16:00 – 16:30 | Competitors familiarize themselves with the venue |
| | 16:30 – 17:00 | The opening ceremony of the Competition (specific time is subject to the official publication of Executive Committee) |
| Day 1 | 08:00 | Competitors arrive at the designated area for gathering and check-in. |
| | 08:00 - 08:40 | Competitors draw their Competition and workstation numbers, and receive the sealed and stored equipment |
| | 08:40 - 08:50 | Competitors check their equipment and tools, and sign for confirmation |
| | 08:50 - 08:55 | The TP of Phase I and Competition consumables will be distributed |
| | 08:55- 9:00 | Judges will interpret the Competition precautions |
| | 9:00 - 12:00 | Competition (Phase I) |
| | 12:00 - 12:55 | Competitors have lunches and take a rest |
| | 12:55 - 13:00 | The TP of Phase II and Competition consumables will be distributed |
| | 13:00 - 15:00 | Competition (Phase II) |
| | 15:00 | End of the competitions of all teams with miscellaneous documents submitted |
| | 15:00 – 18:00 | Marking of completeness of Competition tasks and functional implementation |
| | 18:00 - 20:00 | Collection, counting, decryption and submission of competition results and |
| | 20:00 – 24:00 | Announcement of competition results |
| Day 2 | 9:00 – 9:30 | Competition comments |
| | 9:30 - 10:00 | Announcement of Competition results, award and prize presentations and the closing ceremony |

The above processes are temporary. The final flow chart will be fine-tuned based on the organizational needs of the Competition. For a specific flow chart, the official release of the Competition guidelines made by organizing colleges shall prevail.



| | |
|--|---|
| 检录 | Check in |
| (选手持参赛证、身份证、学生证及相关证件在规定时间内及指定地点,经赛场工作人员检录后方可进入抽签区) | (Competitors should enter the lottery area with their competition certificate, ID card, student card, and relevant certificates after being checked by the venue staff at the specified time and place) |
| 第一次抽签确定参赛编号 | Determination of race number in the first draw |
| (比赛前加密裁判第一次加密) | (The first encryption of encryption judges before the Competition) |
| 第二次抽签确定赛位号 | Determination of workstations in the second draw |
| (比赛前加密裁判第二次加密) | (The second encryption of encryption judges before the Competition) |
| 有序进入赛场 | Enter the venue in an orderly manner |
| 统一分发竞赛任务书 | Distribute competition TP in a unified manner |
| 赛前准备、清点检查通用设备及物料(5分钟) | Conduct pre-competition preparation, check general equipment and material (5 minutes) |
| 比赛(5小时) | Competition (five hours) |
| 过程评分(现场裁判) | Process marking (on-site judges) |
| 竞赛环节结束,提交产品及文件统一离开赛场,至指定候评区 | The Competition ends with products and documents submitted Leave the venue in a unified manner and go to the designated waiting area |
| 裁判分组评分 | Marking in group by judges |
| 比赛结束(选手离场) | End of the Competition (competitors leaves the workshop) |
| 解密,公布成绩 | Decryption and results announcement |

Figure 1 Competition Process Flow Chart

VI. Competition Task Paper

The Competition Task Papers are formulated based on the question library. The design expert panel appointed by the Executive Committee is responsible for the design of this Competition Paper. The direction and difficulty are determined in accordance with the content requirements of the Skill-Specific Competition Rules, relevant standards of the International Council of Aircraft

Owner and Pilot Associations (IAOPA) and relevant professional training standards of vocational schools and national occupational standards issued by the Ministry of Education of the People's Republic of China as well as the training requirements for UAV talents in higher vocational colleges and the position needs of industries and enterprises. After completing the Paper design, the expert panel will submit the Competition Paper to the experts appointed by the Executive Committee for review. When the review is completed, the TP will be published on an online information release platform designated for the Competition.

VII. Competition Rules

1. All Competitions should be conducted in multiple sessions. In line with the Competition Process, the Executive Committee should organize team leaders to engage in the open draw lots to determine their Competition sessions. Teams should enter the workshops in groups for competing, in the light of the time period determined by draw lots.

2. The workstations of workshops should be marked with numbers in a unified manner. Teams should arrive at the designated area for check-in 30 minutes before the Competition, with the workstation numbers determined through draw lots 15 minutes before entering the workshop. After the draw lots, competitors should enter the workshop in line with their workstation number, and then complete the specified Competition tasks at the corresponding workstation. Workstation numbers should be drawn by competitors with the

steps as follows: (1) The drawing judge hosts draw lots at the workshop; and (2) Competitors draw their workstation numbers in a random sequence and sign their signatures on the workstation record card.

3. Tools and equipment and materials for the Competition should all be provided by the host in a unified manner.

4. Workstation numbers of the workshop should be determined through drawing lots by competitors.

5. The practical operation of the Competition should be conducted in the mode of team competition.

6. During the Competition, food and drinking water should all be provided by the host.

7. In accordance with requirements of technical files, competitors must store their Competition documents in the specified folder on the computers at the workstation provided by the host.

8. If a team wants to end the Competition in advance, the competitors should raise their hands to give a sign to the judge. The judge will record the team's end time of the Competition. After the Competition is terminated, no further Competition-related operation by the team is allowed.

9. The teams should submit their Competition results in conformity with procedures. The judges should mark the specified position of the Competition results and sign with the teams for confirmation.

10. After the Competition, the teams must clean up their workstation and

could leave with the approval of the judges.

VIII. Competition Environment

1. The total competition area is approximately 1,000 m². The headroom should be no lower than 3.5 m with good light, lighting and ventilation. Environmental temperature and humidity should be subject to the rules for equipment and meet requirements for smooth competition of competitors simultaneously.

2. The working area of each team should be approximately 20 m² (4 m * 5 m) to ensure that the teams do not interfere with each other. In the working area, there should have three workbenches and five work chairs (stools), one of which is for the operating platform for assembly and debugging of UAV systems. In addition, there should be electronics instruments and meters and tools for the component installation of electronics and mechanical structures, and 220 V power provided on the workbench.

3. Three official and one backup flight space should be set at the workshop, each with an area of approximately 80 m² (8 m * 10 m), height of 4 m and a total flight space of 240 m². The flight space is provided for the flight training and competition flight of teams, and each is protected with an enclosed flight cage.

4. Public service areas of maintenance, health care and supply depots should be available to serve competitors and staff in the workshop; special lanes should be equipped for teachers to enter the workshop for instruction; and safety

lanes should be allocated so that Competition observers and interviewers can launch activities in the safety lanes, and a secure and orderly Competition can be ensured.

IX. Technical Specifications

i. Professional, educational and teaching requirements of the Competition

1. Professionalism;
2. Technical specifications related to the UAV sector;
3. Capabilities of embedded app programming and sensor application;
4. Capabilities of welding, assembly and configuration and debugging applications;
5. Capabilities of electronics measuring technologies and instrument applications;
6. Capabilities of design for electronics circuits and process applications;
7. Capabilities of computer communication applications;
8. Capabilities of automatic control applications;
9. Capabilities of C/C++/Python applications and development; and
10. Capabilities of machine learning and visual recognition applications.

ii. Relevant international and national standards as well as industrial rules

The Competition conforms to the following relevant international and national standards as well as industrial rules:

ISO 21895:2020 Categorization and Classification of Civil
Unmanned Aircraft Systems

| | |
|-------------------------------------|---|
| (EU) 2019/945 | Commission Delegated Regulation (EU) on Unmanned Aircraft |
| ISO9001:2015 | Quality Management System |
| GJB2347-1995 | General Specification for Unmanned Aerial Vehicle |
| GJB3060-1997 | General Specification for Unmanned Aircraft Electrical System |
| GJB5434-2005 | General Requirements for Unmanned Aircraft System Flight Tests |
| GJB5435-2005 | Specification for Unmanned Aerial Vehicles Strength and Rigidity |
| GB/T9813.1-2016 | General Specification for Microcomputer |
| GB4943.1-2011 | Safety of Information Technology Equipment Including Electrical Equipment |
| China Compulsory Certification (3C) | |

X. Technology Platform

i. The foundation and application development platform of UAV

Table 4 Parameter Table of Competition Technology Platform for Assembly and Debugging

| Device | Main component | Technology Platform |
|--------|----------------|--|
| Basic | Flight | 1. Main processor: 32-bit STM32F427 Cortex M4 chip and |

| Device | Main component | Technology Platform |
|---------------------------------|-----------------------|--|
| application training box of UAV | control System | <p>FPU168 MHz/256 KB RAM/2 MB flash memory</p> <ol style="list-style-type: none"> 2. Co-processor: 32-bit STM32F103 fault safety co-processor 3. Sensor: <ul style="list-style-type: none"> ● ST Micro L3GD20 three-axle and 16-bit gyroscope ● ST Micro LSM303D three-axle and 14-bit accelerometer/magnetometer ● MPU 6000 three-axle accelerometer/gyroscope ● MEAS MS5611 barometer 4. Five UART (serial ports) 5. It supports the compatible input of Spektrum DSM/DSM2/DSM-XBSatllite and DX8 6. It supports S.BUS input and output 7. It supports PPM input 8. It supports RSSI (PWM or voltage) input 9. 3.3 V and 6.6 V ADC input 10. External micro USB port |
| | Remote control system | <ol style="list-style-type: none"> 1. 2.4G LCD and 12-lane remote controller, automatic channel detection and frequency modulation 2. The receiver can be matched by leveraging ID code 3. Weight: < 1 kg 4. RF point: 2.4 GHz 5. Telecommunication format: FHSS&DSSS; remote control distance without shelter: Approximately 4000 m |
| | Flight platform | <ol style="list-style-type: none"> 1. Rotor: Quad-rotor 2. Axle distance of symmetrical motors: 400 mm - 430 mm 3. Empty weight: ≤ 2 kg 4. Load capacity: ≥ 500 g 5. Motor: Model 2212; number of types: Three; KV value: 900 to 1500 6. Propeller: Width: Eight to ten inch; number of types: Three; material: Nylon + carbon fiber |

| Device | Main component | Technology Platform |
|---------------|------------------------------|---|
| | | <p>7. Support voltage: 10 V - 18 V</p> <p>8. Drive electronic controller: Continuous drive current: 20 A; short-term current: 35 A; three-phase and brushless drive; output 5V/2A current linear regulator module</p> <p>9. Battery: Polymer lithium battery; specification: 4S; supply voltage: 14.8 V; capacity: 2200 mAh to 5300 mA, providing two continuous discharging ratios which are larger than 25 C.</p> |
| | Parameter adjusting software | Mission Planner |

Table 5 Parameter Table of Competition Technology Platform for Application and Development

| Device | Main component | Technology Platform |
|---|-----------------------|---|
| Application and development training box of UAV | Flight control system | <ol style="list-style-type: none"> 1. Main processor: 32-bit STM32F427 Cortex M4 chip and FPU168 MHz/256 KB RAM/2 MB flash memory 2. Co-processor: 32-bit STM32F103 fault safety co-processor 3. Sensor: <ul style="list-style-type: none"> ● ST Micro L3GD20 three-axle and 16-bit gyroscope ● ST Micro LSM303D three-axle and 14-bit accelerometer/magnetometer ● MPU 6000 three-axle accelerometer/gyroscope 4. MEAS MS5611 barometer 5. Five UART (serial ports) 6. It supports the compatible input of Spektrum DSM/DSM2/DSM-XBSatllite and DX8 7. It supports S.BUS input and output 8. It supports PPM input 9. It supports RSSI (PWM or voltage) input |

| Device | Main component | Technology Platform |
|--------|-----------------------|---|
| | | <ul style="list-style-type: none"> 10. It supports I2C 11. It supports SPI 12. 3.3 V and 6.6 V ADC input 13. External micro USB port |
| | Remote control system | <ul style="list-style-type: none"> 1. 2.4G LCD and 12-lane remote controller, automatic channel detection and frequency modulation 2. The receiver can be matched by leveraging ID code 3. Weight: < 1 kg 4. RF point: 2.4 GHz 5. Telecommunication format: FHSS&DSSS; remote control distance without shelter: Approximately 4000 m |
| | Flight platform | <ul style="list-style-type: none"> 1. Rotor: Quad-rotor 2. Axle distance of symmetrical motors: 400 mm - 430 mm 3. Empty weight: ≤ 2 kg 4. Load capacity: ≥ 500 g 5. Motor: Model 2212; KV value: 1250 6. Propeller: 9045 propeller 7. Support voltage: 10 V - 18 V 8. Drive electronic controller: Continuous drive current: 20 A; short-term current: 35 A; three-phase and brushless drive; output 5V/2A current linear regulator module 9. Battery: Polymer lithium battery; specification: 4S; supply voltage: 14.8 V; capacity: 5300mA; continuous discharging ratio: > 25 C |
| | Visual sensor | <ul style="list-style-type: none"> 1. Main processor RISC-V Dual Core 64bit, with FPU 2. Dominant frequency: 400 MHZ 3. SRAM: Built-in 8M Byte 4. Image identification: QVGA@60fps/VGA@30fps 5. Voice recognition: Eight-array microphone 6. Network model: The model supports YOLOv3, Mobilenetv2, TinyYOLOv2 and facial recognition |

| Device | Main component | Technology Platform |
|--------|-------------------------------------|--|
| | | 7. External setting: FPIOA/USAT/GPIO/SPI/IIC/IIS/TIMER 8. Dimension: 52.3 * 37.3 mm 9. Supply voltage: 5.0 V |
| | Tracking sensor in the visual range | 1. V-SLAM high-precision, visual, inertial, distance-detecting, simultaneous and inertial navigation algorithm 2. Main kernel: Intel Movidius Myriad 2.0 VPU 3. FOV: Imager composed of two OV9282 fish-eye lenses; nearly hemispherical 163±5° field of vision 4. Dimension: 108 x 24.5 x 12.5 mm 5. The socket should be installed with the distance standing at 2 x M3 0.5 mm |
| | Visual controller | 1. SOC: Broadcom BCM2837B0 2. CPU: Quad-core and 64-bit; frequency: 1.4 GHz 3. Bluetooth: Bluetooth 4.2 4. WiFi: 802.11 AC; wireless; frequency: 2.4GHz; dual-frequency WiFi: 2.4GHz/5GHz 5. Wired network Gigabit Ethernet |
| | Remote control Vehicle | 1. Weight: 600 g 2. Bearing capacity: 3 kg 3. Height (from the floor): 20 mm 4. Dimension: 175 * 180 * 85 mm 5. Projection dimension: 170 * 170 mm 6. Remote control distance: 50 m |
| | Parameter adjusting software | QGroundControl |

ii. General tools and equipment and materials

1. Multimeter;

2. Oscilloscope;
3. Standard workbench;
4. Commonly utilized toolbox (including international power plug boards with the function of leakage protection, screwdriver kits, anti-static tweezers, de-solder gun, flat-nose pliers and chip boxes); and
5. Computer (provided by the Competition host in a unified manner whose software installation and debugging should be completed before the Competition).

XI. Result Evaluation

i. Judge formation

| No. | Professional and technical directions | Requirements for knowledge and competence | Judging, teaching and work experience | Professional and technical titles (level of professional qualification) | Head count |
|------------|--|---|---|---|-------------------|
| 1 | Aircraft design and manufacturing | 1. Judges should have the ability to identify images; 2. Judges should have the ability to install and debug UAV systems; 3. Judges should be familiar with the | Judges should have served at a national or provincial Competition; judges should have taken on professional teaching tasks related to UAV application and mapping, with | Judges should be associate professors or senior engineers (or technicians) or above | 12 |

| | | | | | |
|---|--|---|---|--|----|
| | | Competition's professional knowledge and operating skills | the working experience of more than five years | | |
| 2 | UAV flight control | <p>1. Judges should have the ability to control rotor UAVs to fly within and beyond the visual range;</p> <p>2. Judges should be familiar with the Competition's professional knowledge and operating skills;</p> | <p>Judges should have served at a national or provincial Competition; judges should have taken on professional teaching tasks related to UAV application, with the working experience of more than five years</p> | <p>Judges should be associate professors or senior engineers (or technicians) or above</p> | 10 |
| 3 | Machine vision development and application | <p>1. Judges should have the ability to develop and apply machine vision;</p> <p>2. Judges should be familiar with the Competition's professional knowledge and operating skills;</p> | <p>Judges should have served at a national or provincial Competition; judges should have taken on professional teaching tasks related to UAV application, industrial robotics and</p> | <p>Judges should be associate professors or senior engineers (or technicians) or above</p> | 12 |

| | | | | | |
|-------------------------------|---|--|---|---|---|
| | | | applied electronics technologies with the working experience of more than five years | | |
| 4 | Majors related to equipment manufacturing | Judges should familiarize themselves with the Competition rules and encrypted processes and master relevant requirements for serving as a judge in the Competition | Judges should have served at a national or provincial Competition with the working experience exceeding three years | Judges should be associate professors or senior engineers (or technicians) or above | 2 |
| Total number of judges | 36 | | | | |

ii. Marking system

Marking of the Competition follows the principles of fairness, impartiality and openness. The marking criteria focus on inspecting the comprehensive capabilities of competitors which can simultaneously reflect their level of skills

and professionalism.

Table 6 Marking Criteria

| Category | Marking item | Marks | Marking content | Marks | Notes |
|---|-----------------------------|----------------------------|--|---|-------|
| Scoring item | UAV Assembly and debugging | 80 | Competitors assemble UAV (including power model selection and safe use of power) | 30 | |
| | | | Competitors conduct parameter setting and debugging of UAV and remote controllers | 30 | |
| | | | Competitors select the validation models in accordance with tasks and the UAV can fly in a normal manner | 20 | |
| | UAV Flight control | 40 | Competitors control the flight of UAV on the regular Competition tracks | 40 | |
| | UAV Application development | 60 | Competitors debug the functions of visual positioning sensors of UAV | 20 | |
| | | | Competitors debug UAV image identification | 20 | |
| | | | Competitors perform the functions of UAV tracking vehicles | 20 | |
| | Professional quality | 20 | Basic professionalism | 15 | |
| | | | International teamwork | 5 | |
| | Deductions | UAV assembly and debugging | - | Points will be deducted from the total mark if a competitor applies for an additional module beyond the specified time (each) | |
| The competitor replaces the Competition equipment (only once) | | | | 15 | |
| The competitor powers on the UAV | | | | 5 | |

| Category | Marking item | Marks | Marking content | Marks | Notes | | | |
|----------|--|-------|---|---|-------|----------------------------|----|-----|
| | | | with propellers being assembled (each time) | 20 | item | | | |
| | | | The competitor flies the UAV in the prohibited area once | | | | | |
| | UAV flight control | | The UAV of a competitor collides with an obstacle (each time) | 3 | | | | |
| | | | The object falls during the flight and the competitor restarts the flight (each restart) | 3 | | | | |
| | | | The competitor fails to drop the object into the targeted area | 5 | | | | |
| | | | The UAV assembled by the team cannot fly steadily and then the competitor leverages the flight aircraft provided by the Executive Committee of the division | 20 | | | | |
| | | | UAV application and development | The UAV fails to take off | | 10 | | |
| | | | | The flight control module of the UAV fails to be called | | 10 | | |
| | The UAV fails to track the vehicle (restart) | | | 5 | | | | |
| | The UAV is unable to move independently by following the vehicle | | | 10 | | | | |
| | The vehicle moves to an area outside the specified route | | | 10 | | | | |
| | The driving time of vehicle exceeds the specified one (every 30 seconds) | | | 5 | | | | |
| | Extra point | | Additional | 10 | | The competitor selects the | 10 | All |

| Category | Marking item | Marks | Marking content | Marks | Notes |
|----------|--------------|-------|---|-------|---|
| items | tests | | Competition track with considerable difficulties to control the UAV (A presentation platform will be offered for teams or a competitor with extraordinary skills. Specifically, if the competitor finishes his/her flight control within the specified time, he/she can voluntarily select the additional tests whose track has more difficulties.) | | additional difficult tests must be completed, otherwise, zero point will be given |

iii. Result ranking

The result of a team is the sum of marks of professionalism and tasks which should be ranked from high to low in line with the total marks. If the total marks are the same, teams should be ranked in line with the completion time of all tasks of the Competition, with the team spending less time ranked higher; if the completion time of tasks is the same, they should be ranked according to the marks of UAV assembly and debugging module, with the team getting a higher mark ranked high; if marks of the module are the same, they should be ranked in line with the marks of UAV flight control, with the team getting a higher mark ranked high; if the marks of the flight control task are the same, they should be ranked in line with the marks of UAV development, with the team getting a higher mark ranked high. If the marks of Competition tasks are all the same,

teams should be ranked in accordance with professionalism marks, with the team getting a higher mark ranked high. If all the above marks are the same, teams should be assessed in an integrated manner by the jury combining the completion status of additional tests.

iv. Marking by judges

1. The marking of the Competition is strictly in accordance with the principles of fairness, impartiality, openness, reasonableness and standards, and teams will be assessed in an integrated manner in line with competitors' completion status.

2. Team results should be assessed by the Competition jury in a uniform manner. The calculating method of marks which is based on steps without errors transmitted and the accumulative total mark will be adopted. The final result of Competition consists of results of UAV assembly and debugging, flight control and application and development, professionalism and additional tests.

Teams should be ranked from high to low in line with the total marks of their results. Teams whose total marks are the same should be ranked in the light of marks of the following sub-items: UAV application and development, flight operation, assembly and debugging, additional tests and professionalism, with the one getting a higher mark ranked high.

3. If the competitors commit cheating, disobey the instructions of the judge, or disturb the order of the workshop during the Competition, the jury president will deduct the corresponding points according to the rules. Serious

circumstances will result in disqualification from the Competition, with the Competition results recorded as 0 point.

4. After the end of all Competitions, the mark keeper will summarize the declassified results of teams as the final results, and announce the latter after the signature of Competition jury president and leader of the supervision and arbitration team. The final results will be submitted simultaneously to the Competition management system.

5. The jury president will submit the marking results of workstations after the completion of judging by judges and the end of the Competition. After the results are re-checked and confirmed to be correct, the jury president, supervising personnel and arbitrators will sign for confirmation before the announcement.

6. As for this Competition, the final results of teams should be printed. Upon review by the Competition jury president with the signature signed, the printed results signed by the jury president should be sent to the Executive Committee.

XII. Awards and Prizes

One gold medal, one silver medal and one bronze medal will be awarded for the Competition to three teams, respectively, and the teams in the top 50% of the total results (other than the Top 3) will be awarded the winning prize.

XIII. Preliminary Plans for the Competition Venue

The workshop will offer standby workstations with the number being 5% of the total of teams; backup personal computers and equipment will be prepared in

an adequate manner. Equipment can be replaced by technical support personnel of the workshop to timely replace those with accidents, power failure and faults, upon recognition by on-site judges and jury president.

If an accidental injury, unexpected illness and other major incidents occur during the Competition, the jury president should immediately suspend the relevant personnel from the Competition. The school doctor at the medical station of the host school is the first aid to rescue the patient, and if it is a serious case, the patient must be immediately sent to the hospital by calling 120. If any competitor has a fever in the workshop, the case should be handled according to the pandemic prevention and control plan of the Executive Committee.

i. Preliminary plans for solving the faults of computers utilized in the Competition

1. In case of faults of computers for the Competition resulting from personal subjective causes or wrong operation, the computers should be replaced upon on-site judging by the jury president, technical personnel and arbitrator. Corresponding on-site trouble records should be ensured (the competitors should sign the records for confirmation). Time will not be compensated for the delay to the team when the Competition time is over.

2. In case of software and hardware faults of computers for the Competition or external factors that lead to the fact where computers fail to work normally, the computers should be replaced upon on-site judging by the jury president, technical personnel and arbitrator. Corresponding on-site trouble records should

be ensured (the competitors signed the records for confirmation). If there is time lost during the emergency response (from the start of equipment faults to the end of response), the team will be compensated as appropriate for the time delay after the Competition time ends.

ii. Preliminary plans for a power failure during the Competition

1. On-site Competition is supported with dual-circuit AC power to ensure that when one circuit goes wrong, the spare circuit can be activated for power supply. Technical personnel should be organized for troubleshooting, which can secure the recovery of normal use of dual-circuit power.

2. Each workstation is equipped with a separate leakage protector so that AC power faults caused by improper operation by competitors will only influence the power supply of the workstation rather than other workstations.

3. After the power failure during the Competition and judging by the jury president, technical personnel and Competition arbitrator:

(1) If the power failure is caused by faults of power supply lines, for workstations that have been affected, the team will be compensated as appropriate for the time delay after the Competition time ends in case of time lost during the emergency response (from the start of equipment faults to the end of response). Corresponding on-site trouble records should be ensured (the competitors should sign the records for confirmation).

(2) If the power failure is caused by the competitor's improper operation, no compensation for the delay will be given after the Competition time ends. In line

with the Competition rules, judges should deduct points at their discretion, with corresponding on-site trouble records being ensured (the competitors should sign the records for confirmation). For other workstations that have been affected, if there is time lost during emergency response (from the start of equipment faults to the end of response), the team will be compensated as appropriate for the time delay after the Competition time ends. Corresponding on-site trouble records should be ensured (the competitors should sign the records for confirmation).

XIV. Safety

i. Requirements for pandemic control safety

Pandemic control should be implemented in line with the unified requirements of the Executive Committee

ii. Requirements for Competition safety

Event safety is a prerequisite for the smooth running of all tasks of skill Competition and a core issue during the preparation and operation of Competition. The Executive Committee should take practical and effective measures to ensure the personal safety of competitors, teachers, judges, personnel, and audiences during the Competition.

1. The Executive Committee should organize a special inspection on the venue, accommodation places and transportation before the Competition, and make explicit safety requirements. The arrangement of the workshop, the equipment and facilities within the workshop, should comply with the relevant

national safety regulations. If necessary, workshop simulation tests can also be conducted to identify possible problems. The organizer must exclude hazards in accordance with the requirements of the Executive Committee before the Competition.

2. A cordon should be set up around the workshop to prevent the entry of unauthorized persons in case of accidents. The necessary labor protection should be provided for the competitors with reference to the requirements of the relevant occupational posts within the competition site. In the section with dangerous operation, the judges should take strict precautions against the wrong operation of the competitors.

3. The organizer should provide conditions to ensure the implementation of the preliminary plans. For competitions involving large power consumption, fire-prone and other circumstances, policies and plans should be defined, and first aid personnel and facilities equipped.

4. A plan for the evacuation of people from the workshop and experience areas should be developed. In addition to complete indication signs, additional guidance personnel shall be assigned and alternate lanes shall be opened in areas where there are crowded and intersecting traffic and pedestrian flow in the workshop environment.

5. It is strictly forbidden for competitors and judges to bring communication and mobile storage equipment and other materials and supplies related to the Competition into the workstations and workplaces. It is strictly

forbidden for competitors to bring dangerous goods and contraband into the venue. After the end of Competition, it is rigorously prohibited for competitors to leave the workshop with any supply related to the Competition.

6. During the Competition, in principle, the Executive Committee should arrange the food and drinking water for competitors and teachers. The organizer shall respect the culture and beliefs of ethnic minorities and arrange the food and accommodation for the competitors and coaches of ethnic minorities in accordance with relevant national ethnic policies.

7. Each school must arrange to purchase personal accident insurance for competitors during the Competition when organizing the teams. After the teams of each school are formed, relevant management policies must be formulated and safety education should be provided to all competitors and teachers. Teams should strengthen the safety management of the competitors and achieve the alignment with the safety management of the workshop.

8. If an accident occurs during the Competition, whoever identifies it should report to the Executive Committee immediately, and also take measures to avoid further deterioration. The Executive Committee of the Competition should immediately activate the preliminary plan to address the problem and report to the Executive Committee of the division. A Competition may be suspended if there is a major safety problem, and whether to suspend it should be determined by the executive committee of the division. After the event, the executive committee of the division should report the details to the Executive

Committee.

XV. Competition Notice

i. Notice for teams

1. Team formation: Each team should consist of three competitors and two instructors, one of which should be the team leader.

2. Competitors should not be replaced, in principle, after their entry registration is confirmed. After the Competition starts, the team is not allowed to replace the competitor. Competitors are allowed to miss the Competition.

3. Teams must hold competition certificates issued by the Executive Committee and valid IDs to participate in the Competition and relevant activities, in accordance with the Competition process.

4. Each team should engage in the pre-competition activities arranged by the Executive Committee in a unified manner to familiarize themselves with the venue. In accordance with the uniform requirements of the Executive Committee, each team should participate in the pre-competition briefing and draw lot ceremony.

5. During the Competition, teams should safeguard the safety of all competitors to prevent accidents and other unexpected incidents. To be specific, they should purchase personal accident insurance for competitors.

6. Each team should carry forward the good morals, listen to the command, obey the judges, and do not falsify.

ii. Notice for instructors

1. All instructors should carry forward the good moral practices, follow instructions and the judges' decisions and refrain from any cheating act.

2. Instructors should conscientiously study and grasp the technical rules and requirements for the workshop of the Competition in order to instruct competitors on necessary preparations before the Competition.

3. Instructors should make technical and work summaries after the Competition.

iii. Notice for competitors

1. Competitors should arrive at the workshop 30 minutes in advance. Students should hold their ID cards (passports), student cards and other valid documents for check-in after which they should hand over relevant certificates to accompanying team members for safekeeping and enter their workstations with entry cards and drawn workstation numbers. Competitors should enter the workstation as required, and are not allowed to arrive late or leave the workshop early. It is strictly forbidden for competitors to bring any electronic equipment, communication equipment and other materials and supplies irrelevant to the Competition to the workshop; when entering the workstations, students are not allowed to carry any communication equipment; if any, they should hand over the equipment to accompanying team members for safekeeping.

2. Tools, equipment and materials for the Competition should be provided by the host in a unified manner. All teams can choose and leverage them in line with actual needs.

3. Workstations should be decided by drawing lots and should not be changed or adjusted without permission.

4. Competitors are not allowed to leave the workshop without permission during the Competition. If there are special circumstances, consent must be obtained from the judges. If competitors take a break, drink water, and leverage the restroom, all of these are included in the Competition time, and zero extra time will be allocated. The Competition timing tool is subject to the clock placed at the workshop.

5. During the Competition, competitors are not allowed to bring communication tools such as mobile phones to the workshop; and no information can be transmitted in any way between competitors who are not from the same team, such as slips of paper, hand gestures, and argots.

6. All people in the workshop should neither talk loudly, nor affect other competitors from completing their tasks.

7. Competitors should protect equipment in the workshop, and should not move desks, equipment, and other items or deliberately damage equipment and instruments. During the Competition, competitors must strictly abide by relevant operating procedures to ensure personal and equipment safety, and are subject to the supervision and warnings of the judges.

8. When performing tasks, competitors should not discuss with or peep other competitors.

9. Competitors should have sound professionalism and raise hands when

communicating with judges.

10. During the Competition, competitors must strictly follow the operating procedures for safety and receive the supervision and warnings of judges, so as to ensure their personal and equipment safety. If a personal safety accident and equipment fault occur due to the competitor's incorrect operation, the jury president have the right to terminate the team's Competition.

11. If a team wants to end the Competition in advance, the competitors should raise their hands to give a sign to the judge. The judge will record the team's end time of Competition. After the Competition is ended, no further Competition-related operation by the team is allowed.

12. Competitors must submit their Competition results in conformity with procedures, support judges to record information about the workshop, and sign and confirm together with judges. They should not reject to sign when it is required by judges.

13. Competitors should go to the designated place after the completion of Competition tasks and hand-over matters or at the end of the Competition time, and leave the workshop when the working personnel announce that the Competition is over.

14. During the Competition, competitors must keep good spirit and order, and place items in an orderly manner. Moreover, they should count the tools, tidy up the workshop and sort out materials after the Competition.

15. Competitors should speak politely, respect judges and other competitors,

and should neither verbally abuse judges and working staff of the workshop nor fight.

16. Anyone should not give a hint, instruct, or help competitors in any way, otherwise, competitors' results should be deducted in accordance with the severity of consequences.

17. During the Competition, except for the competitors, judges, on-site working staff and approved personnel of the session, other people are not allowed to enter the workshop. At the end of the Competition, competitors should leave the workshop as instructed in a timely manner. Those who do not follow instructions but make trouble out of nothing should be held accountable and a notice of criticism should be circulated.

18. The jury president will remind competitors twice about the time before the end of the Competition. After the jury president issues an instruction to end the Competition, all teams that have not completed the task should immediately stop operation and clear their workstations as required. The Competition time should not be delayed for any reason.

19. Competitors are not allowed to take the distributed items related to the Competition out of the workshop, such as the TP and scratch paper. Furthermore, competitors must be checked by on-site judges and obtain their approval before leaving the workshop.

20. Teams need to submit their Competition results in line with the requirements. Moreover, judges should sign with the competitors for

confirmation.

21. If there is any problem with missing pages or illegible handwriting in the TP, please promptly indicate them to the judge and have them replaced; after the Competition, all paper materials provided for the Competition must be left in the workshop; once found, the competitor will be regarded as a cheater.

22. In the process of completing tasks, five points will be deducted if a short circuit of 220 V AC power occurs.

23. In the course of the Competition, if a personal or equipment safety accident is caused due to improper operation, 10 to 20 points will be deducted, and the competitor will be disqualified from the Competition if the circumstance is serious.

24. Ten points will be deducted if the competitor disobeys the judge, and disturbs the order of the workshop. In addition, if the circumstance is serious, the team's result will be canceled. If there is cheating, the team will be disqualified from the Competition.

25. When a competitor violates the discipline of workshop, one to five points will be deducted according to the circumstance. As for serious circumstances resulting in adverse consequences, the violation should be reported to the Executive Committee for approval and then the jury president will announce that the competitor's competition is terminated.

26. When an on-site judge announces that the Competition time is up but competitors still continue the operation, one to five points will be deducted and

recorded by the judge. For those with severe circumstances and continuing to operate after warnings, the competitors will be disqualified from the Competition.

27. Teams should complete the content required in the TP within the specified time, and files formed during the implementation of tasks must be stored in the designated position as required. If the jury cannot inspect the results because the files are not stored in the designated position, zero point will be awarded for corresponding parts.

28. During the Competition, a competitor who determines that the equipment or device is faulty may propose to the judge for replacement; if the device or equipment is determined to be intact upon detection, the decision time will be included in the Competition time; if the device or equipment is determined to be faulty, it will be replaced on the spot, and the time lost during this process (from the start of equipment detection to the end of replacement) will be equivalently compensated for the team after the Competition time is over.

iv. Notice for the working staff

1. The working staff should examine competitors' documents. In addition, competitors should engage in the check-in and Competition on time with their valid documents; if not, they will be regarded as forfeited.

2. The working staff should strictly manage the time. Competitors can start the skill Competition only when the starting signal is given. During the Competition, the time for taking a break, drinking water or utilizing the restroom

should all be included in the operation time. Drinking water is offered at the workshop and the working staff should serve earnestly.

3. Competitors are not allowed to bring communication tools into the workshop. For those who privately carry the tools into the workshop, they will be disqualified from the Competition once identified.

4. Competitors can ask judges questions upon permission which must be answered by the latter directly.

5. The workshop should be quiet with smoking prohibited. Judges and working staff in charge of their own workstations should not enter other workstations casually.

6. If a competitor wants to end the Competition in advance, he/she should give a sign to the judge. The judge will record the competitor's end time of the Competition.

7. When the end signal of Competition is given, personnel should supervise competitors to abide by judges' instructions, and leave the workshop with the permission of judges.

8. All working staff must wear unified badges issued by the Executive Committee with neat dressing. Except for on-site personnel, other persons should not enter the workshop without permission.

9. News media entering the venue must be permitted by the Executive Committee, and obey the arrangements and management of the venue personnel.

XVI. Appeal and Arbitration

i. Arbitration

1. An Arbitration Committee of the Competition ("Arbitration Committee") has been established for the Competition, with the number of arbitrators no less than three. All arbitrators are from third parties unrelated to the Competition.

2. The Arbitration Committee should accept the appeals, reviews and arbitration occurring during the Competition to ensure successful Competition and fair and just results.

ii. Appeal

1. Teams can file an appeal against equipment, tools and software that do not comply with the Competition rules, unfair judging, as well as rule violations of working staff.

2. Appeals should be filed within two hours after the Competition ends, and should not be accepted after the time limit has expired. When appealing, the team leader should submit the written appeal report to the Committee of Judges in line with specified programs. The report should give a full and factual account of the incident, time, personnel involved and the basis and reason for the appeal. Appeals with insufficient factual basis and based solely on subjective assumptions should not be accepted.

3. When the Arbitration Committee receives the appeal report, it should review it according to the reasons for the appeal. Within four hours, the Arbitration Committee should inform the team of the processing result in the form of written notification.

4. The complaining party should not refuse to accept the handling result without any reason, and should not take extreme actions to create difficulties for or attack the working staff, otherwise, the team will be regarded as giving up the appeal. If the complaining party still disagrees with the handling result made by the Arbitration Committee, the team leader may submit an appeal to the Supervisory Arbitration Committee of the division. The arbitration award of the Supervisory Arbitration Committee of the division shall be final.

XVII. Competition Observation

The competition site will have a technical exhibition area to display the teaching and reforming achievements in higher vocational education.

i. Observers

Observers can be experts, technicians and instructors from relevant enterprises, institutions, colleges and industrial associations.

ii. Observation method

Within the specified time, observers can enter the workshop for observation in groups and in an orderly manner under the guidance of the workshop guides.

iii. Observation discipline

1. Observers must bear the observation cards;
2. During observation, observers should not discuss or communicate with each other concerning the Competition, and communication with competitors is strictly prohibited;
3. During observation, observers should not stay in front of a workstation

for fear of influencing competitors;

4. During observation, observers should not raise any question to the workshop judges and personnel; and

5. No photo during the observation.

For those who violate the above rules, their observation qualifications will be canceled immediately.

XVIII. Live Competition

1. Under the unified arrangements of the Executive Committee, modern network media technologies are utilized for the live broadcast of all Competition processes at the workshop.

2. Multi-media technologies and equipment are leveraged to record videos and the whole process of the Competition, provide comprehensive information for publicity, arbitration, and resource conversion, and produce course streaming resources after the Competition.

3. Videos of interviews with outstanding competitors and instructors and comments by experts and judges should be produced and released on the specified website to highlight the focal points of skills, advantages and characteristics of the Competition.

XIX. Resource Conversion

Under the guidance and supervision of the Executive Committee, a plan for resource conversion should be submitted to the office of the Executive Committee by the host school within the specified time after the Competition.

Resource conversion should be completed within half a year. Converted resources should be uploaded to an online information release platform designated by the Competition.

1. Forms of resource conversion

In accordance with the unified requirements of the Executive Committee, the content of tasks related to the Competition should be refined and integrated, with text documents, PowerPoint and videos produced.

2. Training for double-qualified teachers

Through the conversion from Competition to teaching resources, national training for professional teachers and relevant training for teachers can be conducted. Both of the training are conducive to the systemic cultivation of double-qualified elite teachers of schools and can enhance teachers' teaching level and practical skills.

3. Summary and promotion of the training mode

Before and after the Competition, school leaders and teachers and students should be organized to attend symposiums to summarize and popularize excellent training modes and experience, thus helping participating colleges, schools, teachers and students improve their levels of teaching instruction and skilled training.

XX. Miscellaneous