

‘Remote Sensing Plus’ Training Mode of Innovation and Entrepreneurship Talent Nurturing through College Student Competitions

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ABSTRACT:

Innovation leads the development of technology and society, so the position of innovation and entrepreneurship training to nurture innovative talents is very important. The paper explores the ‘trinity’ innovation and entrepreneurship talent training model of ‘promoting learning through competition, education through competition, and innovation through competition’, focus on high level innovation and entrepreneurship competitions, enhance the stickiness among colleges, educators, students, and social enterprises, and enable students to participate in extracurricular academic activities that are highly consistent with the needs of the industrial market. To achieve this goal, School of Remote Sensing and Information Engineering of Wuhan University puts forward a ‘remote sensing +’ training model. Through the two-year practice of this model, 136 students from different schools and majors participated in the training of the ‘Remote Sensing +’ Innovation and Entrepreneurship Center in Wuhan University, and won three gold awards in the China’s largest innovation and entrepreneurship competition. Due to the characteristics of cross-integration of remote sensing science and technology itself, it has played a supporting role in innovation education, integrating other multi-specialized knowledge, and providing more entrepreneurial and employment opportunities for students of related majors.

1. INTRODUCTION

Innovation leads the development of technology and society, so the position of innovation and entrepreneurship training to nurture innovative talents is very important. A large quantity of countries has successively implemented innovative education reform for colleges. Remote sensing science and technology, as a new interdisciplinary subject developed on the basis of the integration of surveying and mapping science, space science, electronic science, earth science, computer science and other disciplines, presents a good market expectation in the world. And the expectation promotes the demand for innovative and entrepreneurial talents.

Innovation plays an important role in world economic growth (Thompson, 2018) and is also an important factor affecting overall productivity growth. Although various indicators of global innovation tend to be low in 2022 due to the impact of the epidemic, innovation will be a key factor affecting sustainable social development in the long-term future (Silvestre et al., 2019). Therefore, further promoting innovation and developing innovative education have long-term significance for the overall strength of the country and socio-economic operation. Remote sensing science and technology is a new interdisciplinary discipline developed on the basis of the integration of surveying and mapping science, space science, electronic science, earth science, computer science, and other disciplines. Its origin is the innovative development of existing industries. Throughout the history of the development of remote sensing, its development process resonates with the advanced technology of the times (Wolf, 2003). Through the transformation and application of advanced technology and theory, remote sensing has maintained its own progressiveness and vitality of the discipline. As the subject of remote sensing has actually sunk into the industrial field, it has also been adapting to different needs in different times and application fields, and its self-adaptability is also promoting internal innovation. Therefore, remote sensing is a discipline field closely related to innovation, and innovation. Currently, remote sensing science and technology, as a STEM specialty, has good market expectations beyond certain professional thresholds. Under the current market performance, society still continues to need innovative talents in the field of remote sensing (Chasmer et al. 2021).

The paper explores the ‘trinity’ innovation and entrepreneurship talent training model of ‘promoting learning through competition, education through competition, and innovation through competition’, focus on high level innovation and entrepreneurship competitions, enhance the stickiness among colleges, educators, students, and social enterprises, and enable students to participate in extracurricular academic activities that are highly consistent with the needs of the industrial market.

1. Promote learning through competition: cultivate new forces of innovation and entrepreneurship. It aims to stimulate the creativity of the college students, cultivate their academic thinking ability and team cooperation ability, temper their willpower, expand their international vision, increase their wisdom and talents in innovation and entrepreneurship, and strive to grow into promising talents with both ability and integrity.
2. Promote education through competition: explore new ways of quality education. Take competition as an important starting point for deepening the reform of innovation and entrepreneurship education, guide students to actively serve the international strategy and regional development, deepen the comprehensive reform of talent training, comprehensively promote quality education, and effectively improve students' innovation spirit, entrepreneurship awareness and innovation and entrepreneurship ability. Promote the profound transformation of talent training paradigm, and form a new concept of talent quality, teaching quality and quality culture.
3. Promote innovation through competition: build a platform for the transformation of innovation and entrepreneurship achievements of teachers and students. Enhance the interaction between market enterprises and university teachers and students, respond to the market demand, promote the close combination of innovation and entrepreneurship with the transformation of competition results and the applications of research, serve the high-quality development of the social economy, and strive to form a new situation of high-quality entrepreneurship and employment for graduates of colleges.

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2. METHODS

To achieve this goal, School of Remote Sensing and Information Engineering of Wuhan University puts forward a ‘remote sensing +’ training model (as Figure 1 shows).

1. Take the innovation and entrepreneurship competitions (such as China International College Students’ ‘Internet+’ Innovation and Entrepreneurship Competition, and etc.) as the starting point, and practice ‘promoting learning through competition’. How to cultivate innovative and entrepreneurial talents in line with the development of the times has become an important topic for universities to study. The traditional single professional talent quality evaluation method is no longer sufficient to meet the needs of the society for talents, especially in the current situation where emerging industries such as the Internet are rapidly driving the development of the social's economy, the new type of compound and innovative talents with both professional knowledge and comprehensive quality are needed. Higher education needs not only to enable students to master the textbook professional knowledge, but also to stimulate students' enthusiasm for innovative learning, so that students can effectively reflect the usefulness of learning. This new concept of talent quality, in addition to the training and evaluation of traditional academic and theoretical abilities, also needs to strengthen the training and evaluation of students' general knowledge ability, innovation and entrepreneurship creation ability, cultural exchange ability, international exchange ability, hands-on practice ability and other dimensions of quality.
2. Continuously deepen the teaching method of ‘promoting education through competition’ to guide extracurricular student activities in innovation and entrepreneurship, give full play to the supporting role of teacher guidance in student innovation, and grasp the

criteria that what students learn is determined by the social demand for talent cultivation. Teachers can form learning knowledge points by refining the industrialization technology key in innovation and entrepreneurship competition proposition. Teachers can allow undergraduate and graduate students to form teams in a mixed way, learn the knowledge points in the face of professional problems in the major disciplines of remote sensing, and in the face of competition projects. In addition to the traditional classroom teaching quality evaluation view based on "teaching", a new extracurricular practice teaching quality view based on "solving doubts" has been formed.

3. The number of teachers and students participating in various competitions and innovation and entrepreneurship activities in colleges are increasing, the forms are becoming more and more diverse, and the degree of internationalization is becoming higher, which poses a challenge to the teaching management of innovation and entrepreneurship for college students. Exploring ‘promoting innovation through competition’ and establishing a support platform for college students' innovation and entrepreneurship (college students' innovation and entrepreneurship center), on the one hand, is conducive to improving the quality and effect of talent training, on the other hand, is conducive to optimizing and integrating school-running resources. The innovation and entrepreneurship support platform for college students will involve the functions of undergraduate teaching management, graduate teaching management, and academic and industrial management departments. It is necessary to integrate and optimize the relevant functions, establish a new management quality view, and explore the construction and management methods of the international innovation and entrepreneurship support platform for college students, so as to better serve the goal of cultivating world-class innovation and entrepreneurship talents in remote sensing science and technology.

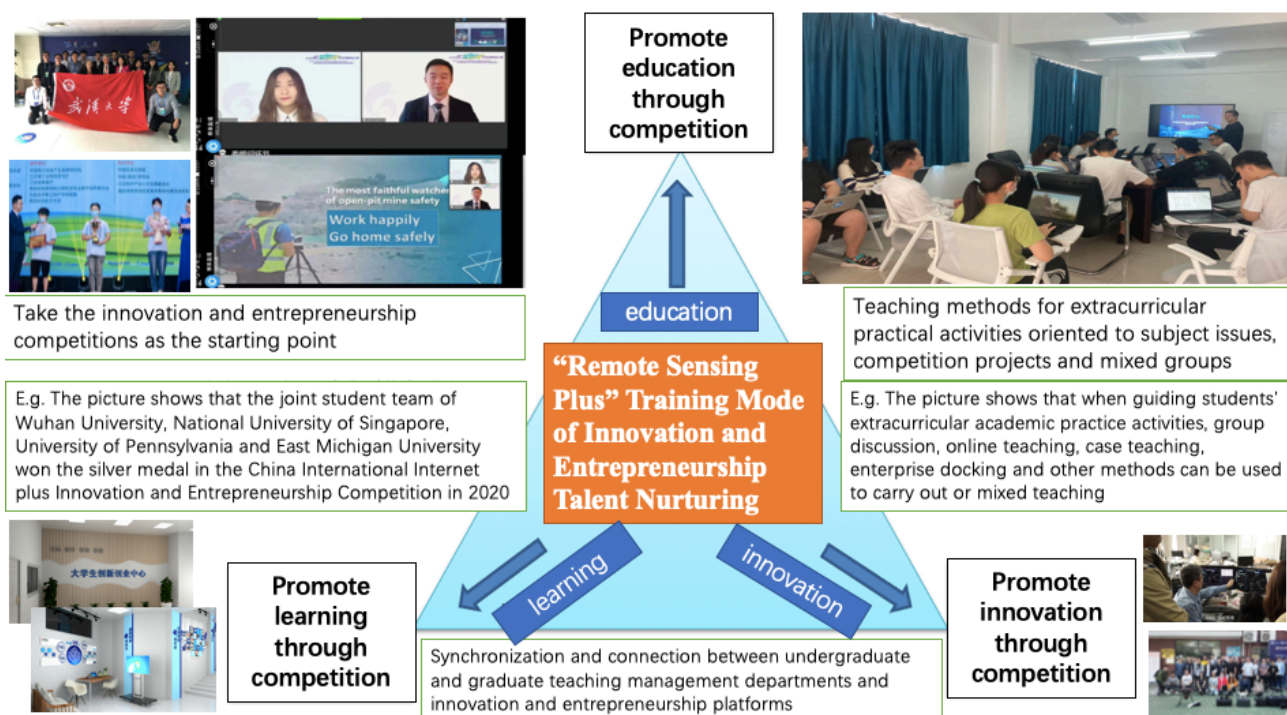


Figure 1. ‘Remote Sensing Plus’ Training Mode Structure.

3. TALENT NURTURING

According to the development needs of innovative talents, many universities have established a complete innovation education and training system in recent years (Li et al. 2013). In the field of remote sensing and related disciplines, many universities have proposed diverse innovative talent cultivation programs based on the interdisciplinary, universal, and international development quality of remote sensing courses (Wang et al. 2013) and their own teaching practices. Emphasizing application practice and implementing project based management are important characteristics of these schemes.

To be also an entrepreneurial education training center, it initiates to have a focus on undergraduate student starting from enrolment to graduation, which offered constant encouragement, training and support for their efforts to conceive and start up business enterprises with prototype they conceive (Wolf et al., 2017). In this regards, we should also examine a factors required by the universities in bolstering the better prelude efforts towards the students in technopreneurship by indicating the competition, technology transfer and university policy which had benn already be by some technological universities (Velikova et al., 2014). The entrepreneurship practices of entrepreneurial decision making, technology commercialization and entrepreneurship policy need also be integrated into the training system. This effort will realize and promote technopreneurship as a way of life and technically know how among its undergraduates.

Through refining the advanced theories in these programs and summarizing our experience in teaching practice during the principal period, we have explored a "trinity" innovative and entrepreneurial talent cultivation model of "promoting learning through competition, promoting teaching through competition, and promoting innovation through competition.". This model focuses on high-level innovation and entrepreneurship competitions, taking universities as venues, and through the organic integration and arrangement of competitions and teaching, achieving high-quality talent cultivation that takes into account both professional and innovative abilities. By strengthening the connection and linkage between innovation education related entities such as universities, educators, students, and social enterprises, students can fully obtain support for innovation, participate in extracurricular activities that are highly aligned with the needs of the industrial market, and help the factors of innovation fully flow into the market.

3.1 Promote learning through competition and cultivate new forces for innovation and entrepreneurship

As a common means of education, competition mechanism places more emphasis on students' cognitive subjectivity than traditional teaching. Through a strong competitive mechanism, it can fully mobilize students' enthusiasm for active learning, release their internal driving force in learning and innovation, and create students' motivation to actively participate in relevant learning and research (Trivino-Cabrera et al. 2021). In this process, students need to stimulate and apply their creativity to achieve transcendence over themselves and even their competitors. On the other hand, the pressure of competition will also exercise their willpower. In large-scale group shape competitions, students can also exercise their team cooperation, coordination, and communication skills, and have more opportunities to conduct international exchanges and expand their international horizons. By developing multiple innovative and entrepreneurial intelligence, students are able to develop in multiple directions and gradually have the ability to lead teams to solve practical problems.

3.2 Promote education through competition and explore new ways of education

Based on competition, it can promote students' ability to develop innovation and entrepreneurship, actively guide a large number of students to form a competitive awareness different from traditional employment in the competition, and guide students to transform from the traditional pattern of employment to a new pattern of innovation and entrepreneurship. Therefore, competition is regarded as an important starting point for innovation education reform. While cultivating students' abilities, students are guided to shift their perspectives from being limited to their own development and the needs of the times, so as to actively serve international strategy and regional development, and actively form innovative spirit, entrepreneurial awareness, and innovative and entrepreneurial ability to achieve a leap in talent literacy. At the same time, deepen the comprehensive reform of talent cultivation, promote the transformation of talent cultivation paradigm, and urge educators to understand and learn new concepts such as talent quality, teaching quality, and quality culture.

3.3 Promote innovation through competition and build a platform for transforming innovation and entrepreneurship achievements among teachers and students

Competition should not be divorced from market needs. By strengthening the linkage between market enterprises and university teachers and students, competition can be brought into market participation at all stages, from purpose to process, from process to result, and fully respond to market demand. Therefore, scientific research and application can be closely combined, promoting innovation and entrepreneurship and the transformation of competition results, responding to the pain points of the times, and serving the high-quality development of social economy. This process can also improve the market recognition of students' abilities, shorten the distance between students' quality and enterprise requirements, improve employment rate and employment quality, achieve high-quality employment, and move closer to application-oriented universities (Wang et al. 2014).

3.4 Practice of the model

Through the two-year practice of this model, 136 students from different schools and majors participated in the training of the 'Remote Sensing +' Innovation and Entrepreneurship Center in Wuhan University, and won three gold and three silver awards in the China International 'Internet plus' students Innovation and Entrepreneurship Competition (China's largest innovation and entrepreneurship competition). Due to the characteristics of cross-integration of remote sensing science and technology itself, it has played a supporting role in innovation education, integrating other multi-specialized knowledge, and providing more entrepreneurial and employment opportunities for students of related majors.

Take the Champion of China Software Cup Competition as example. Wuhan University students built a 1:1 virtual campus in metaverse using remote sensing mapping and photogrammetry technologies in August 2022. The functions of the metaverse include the development of intelligent phonetic system that can control the weather, location and time in the virtual campus. Besides, multiplayer interaction, face recognition and campus touring are enabled in the designed prototype. Compared to the traditional manual modeling method, this project applies nap-of-the-object photogrammetry proposed by an academician from Wuhan University, which can significantly reduce the time cost, and improve the texture

fitness and degree of model simulation. Figure 2 below depicts the designed metaverse virtual landmark buildings in Wuhan University, and also the team built the operation software of the metaverse prototype that allows users to search

the map of the campus, check relevant information, such as weather, humidity, current number of users and suggestion for users, and explore the campus in the virtual space.



Figure 2. Five metaverse virtual landmark buildings in Wuhan University and the metaverse prototype
(Champion of China Software Cup Competition)

4. CONCLUSION

Based on the overall environment and the current situation of remote sensing, we believe that we should continue to pay attention to, invest in, and reform innovation and entrepreneurship education in the field of remote sensing, and propose a talent cultivation model that focuses on innovation and entrepreneurship competitions. This model has achieved remarkable results in undergraduate education and is worth promoting. In the follow-up, on the one hand, we need to continue to improve the details and key points of this training model to improve its reference significance and feasibility in different scenarios, on the other hand, we also need to continue to actively explore the reform of remote sensing innovative education and seek new feasibility of remote sensing innovative education.

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REFERENCES

Chasmer, L.E. Ryerson, R.A. Coburn, C.A., 2021: Educating the Next Generation of Remote Sensing Specialists: Skills and Industry Needs in a Changing World. *Canadian Journal of Remote Sensing*, 48, 55-70, doi.org/10.1080/07038992.2021.1925531

Haryanti, Nor; Nor, Md; Maziah, Siti; et al., 2017: Enhancing Creativity and Innovation in Technopreneurship Education, *Advanced Science Letters*, Volume 23, Number 8, August 2017, pp. 7935-7938(4)

Li, M, Li, Min, Lee, G, 2013: The Study on the System of Innovative Education Based on the Training of Innovative

Talents, 2013 2nd International Conference on Social Science and Education (ICSSE 2013), Dec 24-25, 2013, Hong Kong

Silvestre, B.S., Țircă, D.M., 2019: Innovations for sustainable development: Moving toward a sustainable future, *Journal of Cleaner Production*, 208, 325-332, doi.org/10.1016/j.jclepro.2018.09.244.

Thompson M., 2018: Social capital, innovation and economic growth, *Journal of Behavioral and Experimental Economics*, 73, 46-52. doi.org/10.1016/j.socec.2018.01.005.

Trivino-Cabrera, A, Yuste-Delgado, J., Cuevas-Martinez, A.C., Salvador J.P., 2021: Competition-based Learning in Engineering Degree Programs, *International Journal of Engineering Education*, 2021, 37(5),1359-1370.

Velikova, D; Kohler, J; Gerten, R, 2014: Case Study on Financing and Business Development Processes in Technopreneurship, *Proceedings of the European Conference on Entrepreneurship and Innovation*, Belfast, IRELAND, 445-451

Wang, J, Sheng, Z, Yu, Han, 2013: Popularization of remote sensing education and general course construction in undergraduate education, 35th International Symposium on Remote Sensing of Environment (ISRSE35) APR 22-26, 2013 Inst Remote Sensing & Digital Earth, Beijing

Wang Y, Zhang H, 2014: Exploration and Practice of Talents' Training Model for the Application-oriented Universities, *International Conference on Education, Management and Computing Technology (ICEMCT)*, Tianjin, 100, 371-374.

Wolf, P. R., 2003: Surveying and Mapping: History, Current Status, and Future Projections. *Perspectives in Civil Engineering: Commemorating 150th Anniv. Am. Soc. Civ. Eng* 128: 163–191. doi:10.1061/(ASCE)0733-9453(2002)128:3(79).