Exploration of Ubiquitous Mapping in Engineering Practice Curriculum System of Universities in the Intelligent Age

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Key words: Ubiquitous surveying and mapping, new road exploration, platform construction, epidemic application

SUMMARY

In the current era of digital surveying and mapping to intelligent surveying and mapping, the proposal of ubiquitous surveying and mapping has brought many opportunities and challenges. With the development of ubiquitous surveying and mapping, engineering practice courses in colleges and universities urgently need to respond to the slogan of ubiquitous surveying and mapping, improve traditional shortcomings of surveying and mapping. This time, we explored the new idea of integrating engineering practice courses into ubiquitous surveying and mapping, using three modes of Android, B/S, and C/S to build platforms and integrate relevant knowledge of cutting-edge data processing such as gravity surveying. Cultivating surveying and mapping talents put forward some new thinking, and also provided new ideas for surveying practice classes under the background of the epidemic.

SUMMARY (optional summary in one other language in addition to English, e.g. your own language)

在当前数字化测绘走向智能化测绘的时代，泛在测绘的提出带来了很多机遇和挑战，随着泛在测绘的发展，目前高校工程实践类课程也亟需响应泛在测绘的口号，改进传统测绘的部分短板。本次探索让高校工程实践类课程融入泛在测绘的新思想，使用Android、B/S、C/S三种模式建设平台，融入重力测量等前沿数据处理相关知识，对高校工程实践类课程及培养测绘人才提出了一些新的思考，也为疫情背景下的测量实践课提供了新的思路。

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1. INTRUDUCTION

The rapid development and progress of surveying and mapping disciplines require relevant surveying and mapping education to keep pace with the times and to make corresponding reforms in the design of curriculum training objectives and the organization of teaching content systems (Wang et al. 2013). Colleges and universities have also made many reform models and methods, such as a model combining BOPPPS and online teaching (Guo et al. 2021); Geographic information science majors combine school positioning and professional characteristics, teach students by their aptitude, and have a unique professional construction path (Deng et al. 2021); Some exploration and practice of political education; based on Chaoxing Fanya to build an online course of "Digital Topography", and to carry out the exploration and practice of the mixed teaching model of "Superstar Fanya + Learning Communication + Rain Classroom + Course Tencent QQ Group" (Guo et al. 2017; Cao et al. 2021; Liu et al. 2021); company products and university teaching models Combined, make surveying and mapping education more intelligent and contextual; professional courses are oriented to the curriculum reform and practice of intelligent surveying and mapping training goals. And other promotion and application innovations, all have certain reference values.

At present, the practice courses in colleges and universities are mainly based on traditional surveying and mapping. Traditional surveying and mapping is an activity to accurately describe the length, width, and high azimuth attributes of any area on the surface of the earth through line graphs and other representation methods. The combination of the ubiquitous concept and the surveying and mapping industry is based on the gradual maturity of technologies such as the Internet, the Internet of Things, cloud computing, and big data, to achieve real-time full-sensory and even extra-sensory measurement (including quantification, Modeling, Analysis, and Prediction) (Liu et al. 2020).

Table 1. Problems in professional courses

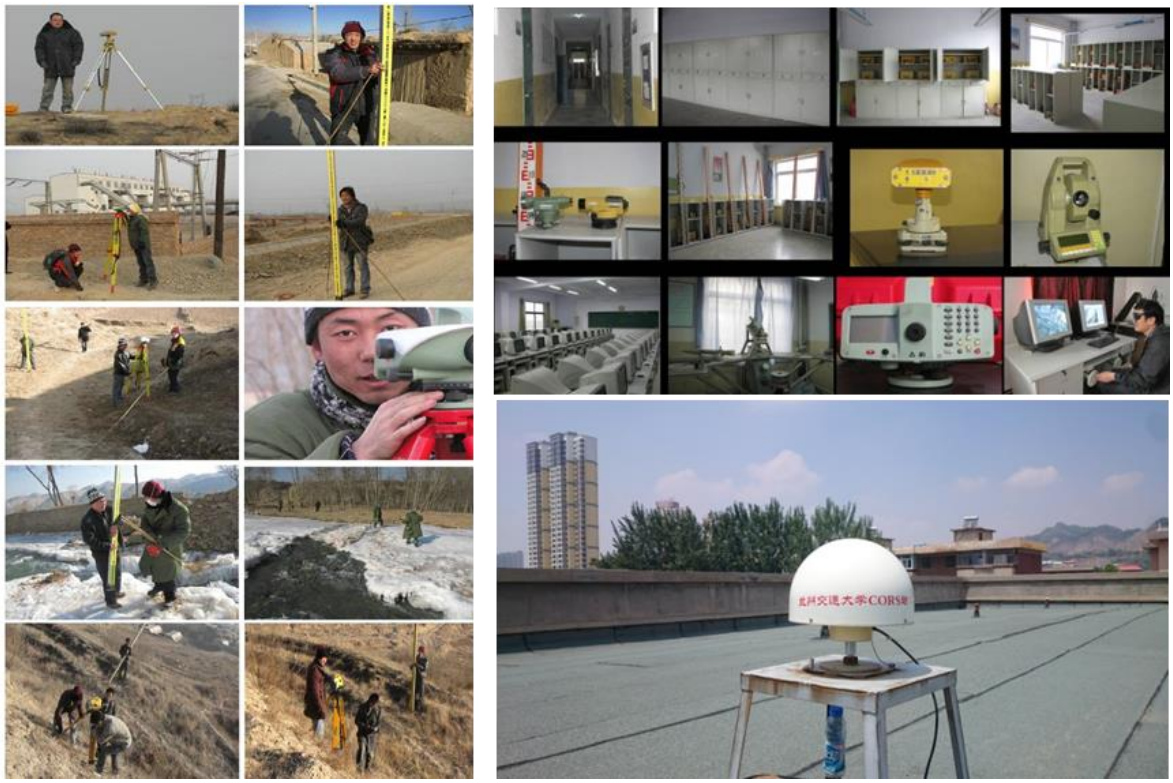
Serial number	Problems	Effects
1	The hardening of repetitive work is serious	Insufficient research, exploration, and innovation ability
2	The combination of theory and practice is not effective	Lost the guiding role of theory class for students
3	No matching tools and platforms in practice	The vast majority of students stay at the calculator stage
4	Single practice content	Insufficient understanding of cutting-edge measurement knowledge
5	The traditional teaching model is nearly paralyzed in the epidemic	Practice classes were canceled during the epidemic

Through the analysis of professional teaching and research, the following problems exist in the current measurement practice courses in colleges (Table 1).

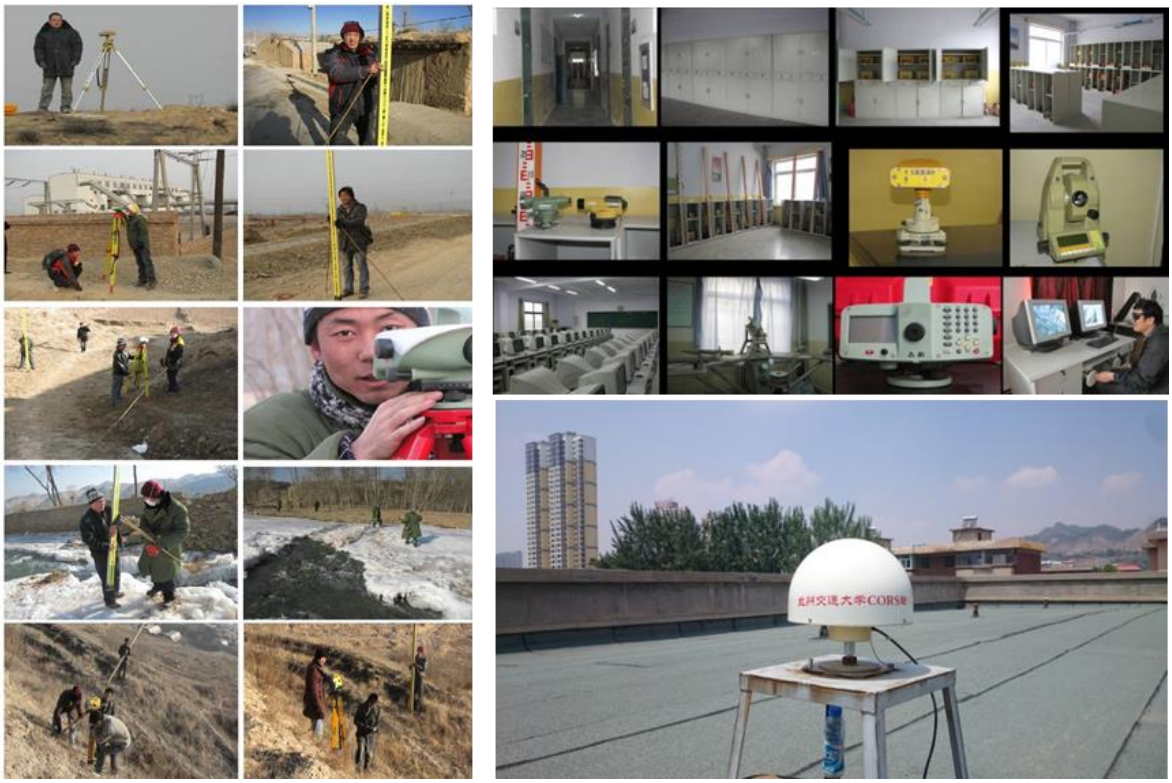
The rapid development and changes of surveying and mapping disciplines and the surveying and mapping industry have made it difficult for traditional single technical talents to meet the needs of application services. Compound innovative talents with wide caliber, solid foundation, and strong ability have become the mainstream of social needs (Wang et al. 2017). It is necessary to explore a new path.

2. RESEARCH STATUS

As an important core basic course in the engineering practice course system of colleges and universities, the measurement practice course has a credit ratio of 36.5%. Its teaching model should rely on Internet technology to realize the transformation from traditional engineering measurement calculation to intelligent and efficient measurement data processing. The transformation of the service platform is in line with the two strategies of focusing on cutting-edge technology exploration and innovative service models in ubiquitous surveying and mapping (Liu et al. 2011). Although scholars in the surveying and mapping industry are also closely integrating the Internet technology to develop relevant platforms for data processing, the commercialization of the platform is too serious at present, and there are no platforms that can take into account engineering practice courses in colleges and universities. Most students still rely on the most primitive (



FiFgure 1), which has an impact on the improvement of students' comprehensive quality and the way of future development.



FiFgure 1. The current situation and using instruments of measurement practice courses in colleges

For the above problems, the main reason is that students from fixed thinking of repetitive work in the process of practice, which makes many students feel that the road of surveying and mapping in the future is difficult, and even begin to give up this road. For this situation, teachers should guide them to change this situation. Combined with the strategy of ubiquitous surveying and mapping in the era of intelligence, students should learn to think for themselves and learn to innovate actively. Doing so will not only make students change their traditional views on surveying and mapping but will greatly promote the development of the surveying and mapping industry in the long run.

3. RESEARCH PROPOSAL

3.1 Demand Analysis

It is a necessary process for students to perform repetitive work, which will help them to consolidate their knowledge. However, excessive repetitive work is not recommended, otherwise, it will greatly hinder the development of students and even the development of the industry in the future. In the field of brain science, the left brain is regarded as the logical brain and the scientific brain, and the right brain is the artistic brain and the creative brain. Under the blessing of Moore's Law, machines can be said to have surpassed the strongest left brain of humans. However, there is no indication that machines can perform autonomous innovation, creation, and creative activities in some form like the human right brain (Liu et al. 2017).

3.2 Research Platform

This exploration will combine ubiquitous surveying and mapping to build based on four enhancements and three models (Figure 2). The four upgrades are: improving data management capabilities; improving data analysis capabilities; improving data timeliness; improving knowledge sharing capabilities. The three modes are: the first one uses the Android mode to explore the shortcomings of the practice course under the background of traditional surveying and mapping in the course; the second one uses the B/S mode to explore the visualization problems in the course; the third one uses the C/S mode model to explore the problem of insufficient application of cutting-edge measurement knowledge by students.

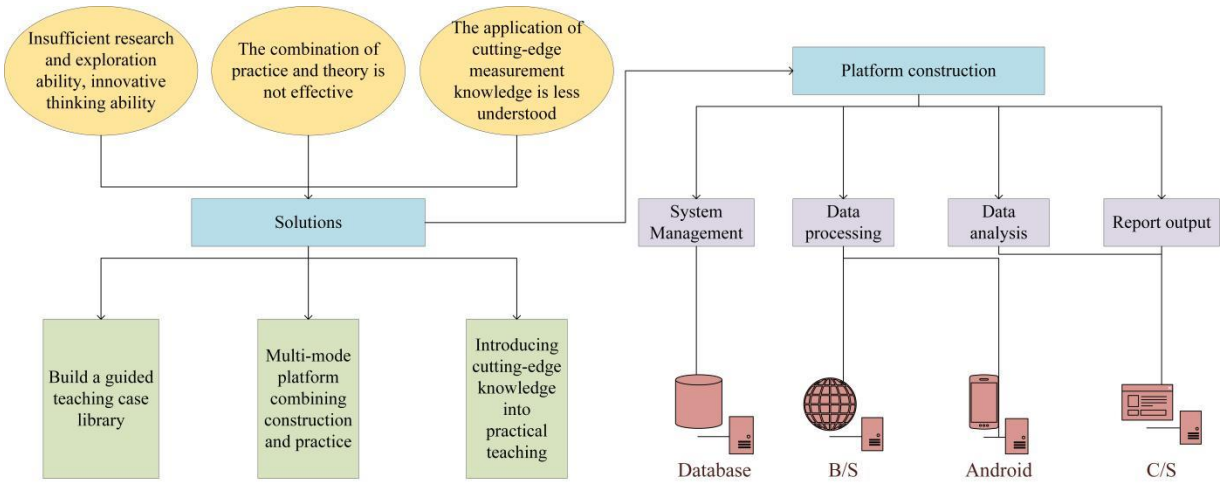


Figure 2. Practical course platform construction under the packed ground of ubiquitous surveying and mapping

3.3 Demonstration of Results

The idea of ubiquitous surveying and mapping in the era of intelligence is integrated into the whole process of teaching. After repeated experiments in the early stage, students are encouraged to actively innovate. Students start to design new platforms by themselves in practical classes and use or improve existing platforms (Figure 3). The three popular fixed modes of Android, C/S, and B/S are selected, but the implementation methods are not fixed. Students choose the method they are best at, fully arouse their interest, and bring a lot of innovation to this exploration. Students were active in thinking in this exploration and realized various forms, including front-end and back-end interaction of Java and XML, a mixed development of C# and Fortran, comparison and confrontation of Python Web and Java Web, and interaction between Excel and various programming languages. This exploration has brought many unexpected results.

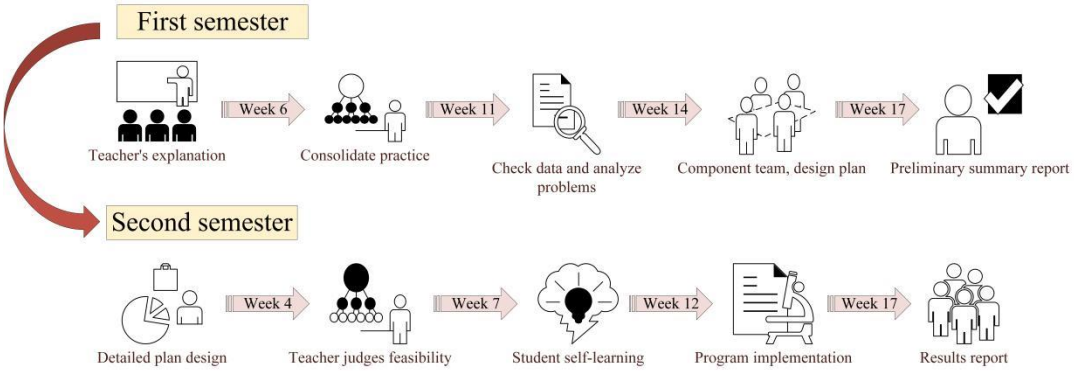


Figure 3. Schematic diagram of the whole teaching process

3.3.1 Results in Android Mode

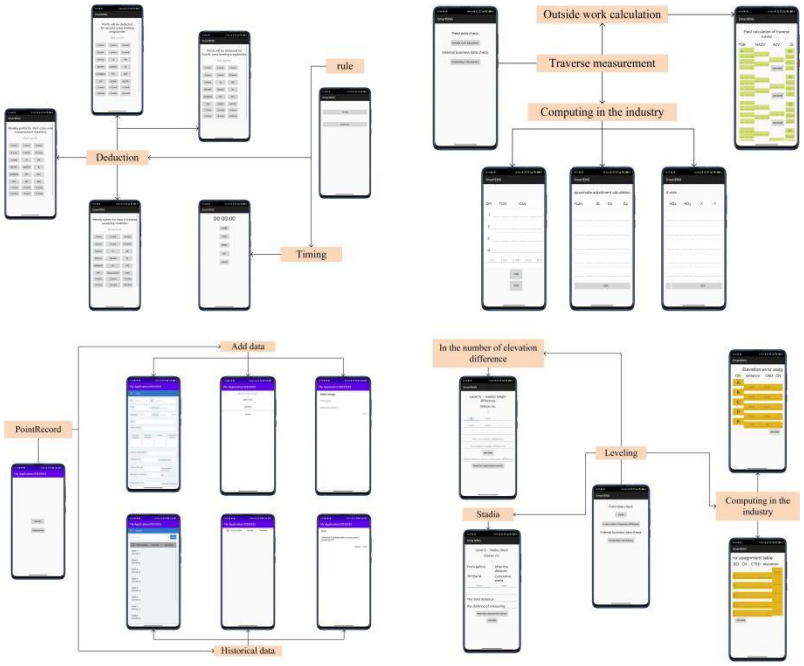


Figure 4. Android model developed by students

The Android mode mainly solves the problems related to data management and data processing of engineering surveying (Figure 4). It has effectively changed the research status of irregular data recording, paper waste, long data processing time, and chaotic data management.

3.3.2 Results of C/S mode

The main achievement of the C/S model is the aspect of gravity measurement (Figure 5). With the background of physical geodetic surveying, students are mainly allowed to carry out gravity data processing and secondary development of the platform. Introduce the basic knowledge of gravity data processing into practical teaching, mobilize students' initiative in learning, and improve their ability to think independently and solve practical problems independently.

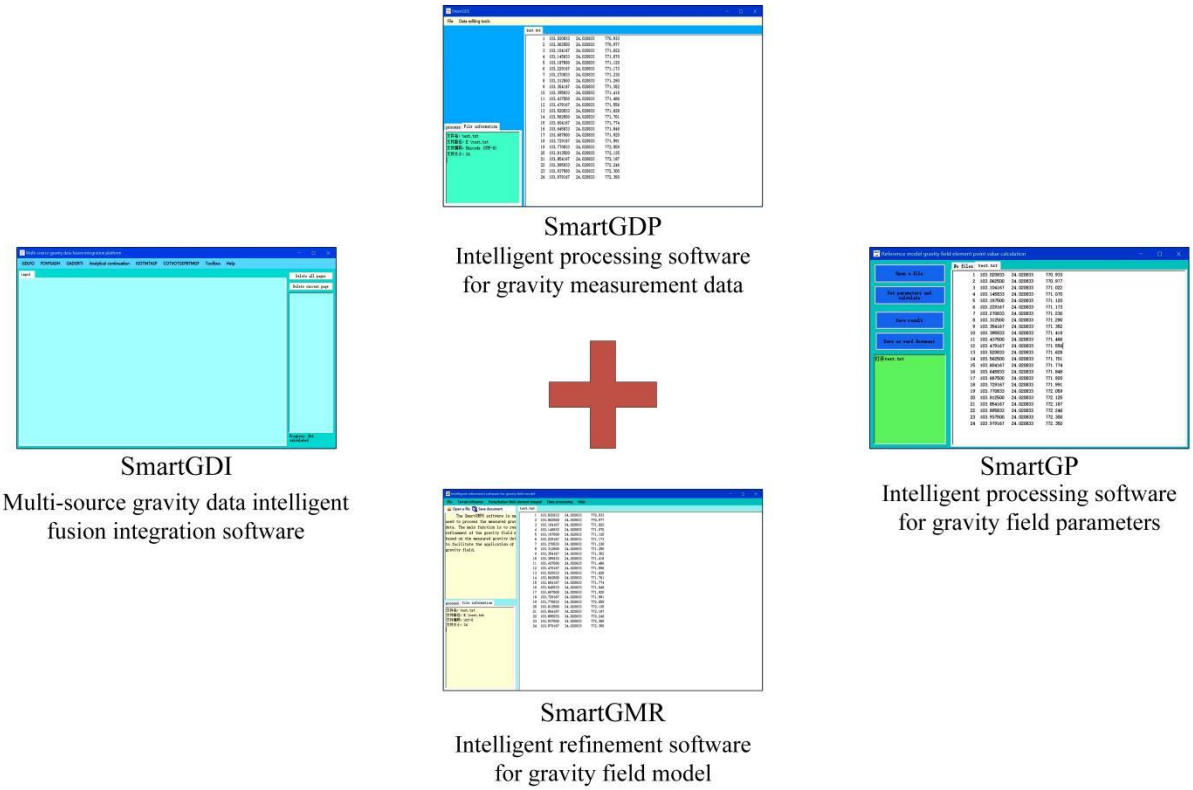


Figure 5. C/S mode developed by students

3.3.3 Results of B/S mode

The B/S mode mainly involves the ability to analyze and process measurement data (Figure 6), presenting the difficult-to-understand mapping data to everyone in vivid charts, so that non-mapping practitioners and government decision-makers can better understand and apply these data, while also responding to the opening of swarm intelligence under ubiquitous surveying and mapping in the era of intelligence.

Figure 6. B/S mode developed by students

4. APPLICATIONS IN THE POST-PANDEMIC ERA

On November 3, 2021, Professor Zhong said in an exclusive interview with "China Focus Face-to-face" that he did not think that the new crown virus can be eliminated, and it may exist for a long time. The current practice courses in universities are paralyzed once they encounter the new crown epidemic, so the new model we are currently exploring should have the ability to resist the uncertainty of the new crown epidemic. In response to the impact of the epidemic on the normal school opening and classroom teaching in colleges and universities, the Ministry of Education of the People's Republic of China issued the "Guiding Opinions on Doing a Good Job in the Organization and Management of Online Teaching in Ordinary Colleges during the Period of Epidemic Prevention and Control", requiring government the way of leading, the main body of the university, and the participation of the society, jointly implement and guarantee the online teaching of the university during the epidemic prevention and control period, and realize the "suspended classes without teaching, and without classes without learning" (Guo et al. 2021). Therefore, it is imperative to explore new methods and new ways.

Applying the route of this exploration to the context of the epidemic, the feedback is very good. Compared with the previous teaching mode, teaching according to the teaching process of the

new model, the teaching plan is less disturbed, and the quality of the curriculum has been improved to a certain extent.

After students' self-assessment (20%), group mutual assessment (30%), and classroom test (50%), the overall assessment results are as follows (Figure 7):

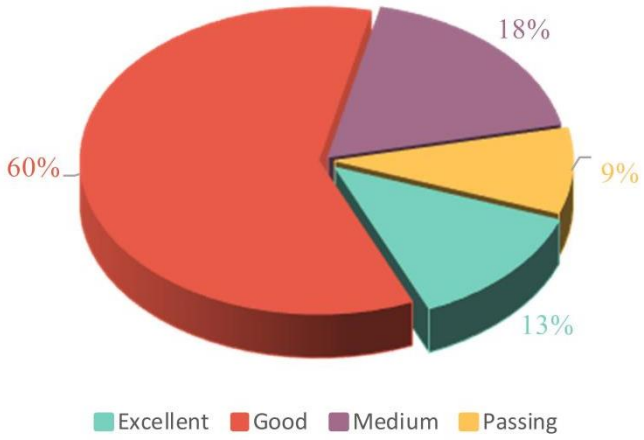


Figure 7. Results of the distribution of grades

Through the method of questionnaires and the evaluation system of the literature (Zang et al. 2021), the research and development results were evaluated (Figure 8):

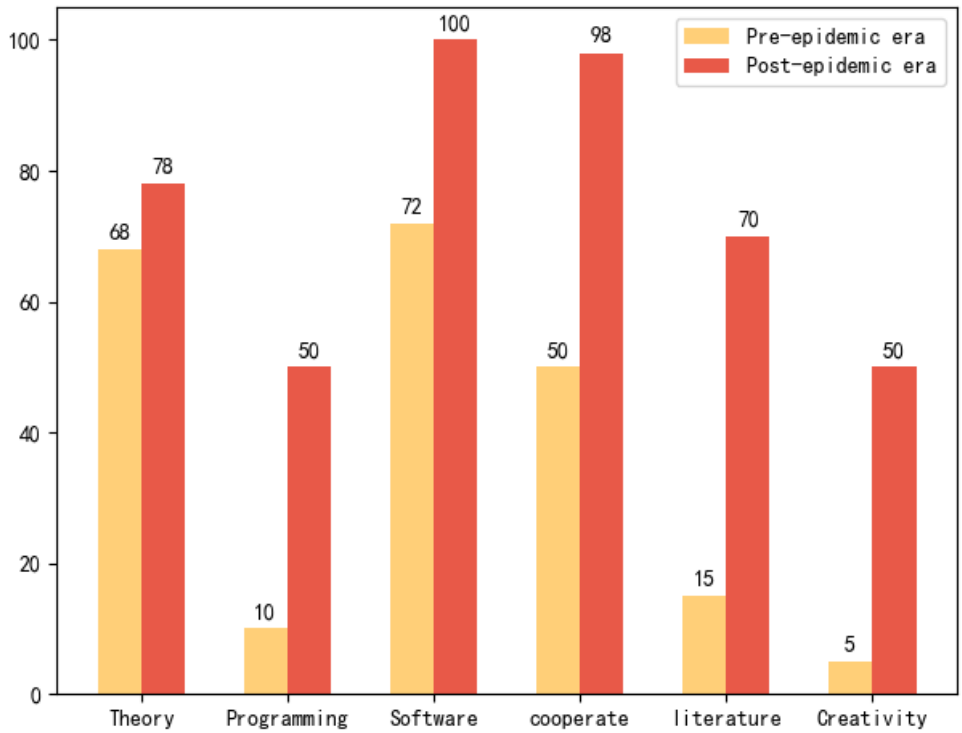


Figure 8. Effect map before and after the epidemic cycle

5. CONCLUSION AND OUTLOOK

This research makes a perfect combination of ubiquitous surveying and mapping related strategies and the current status of engineering practice courses in colleges and universities, breaks the fixed thinking, adopts the route of consolidation first and innovation later, builds a relevant multi-model platform, and integrates cutting-edge surveying and mapping knowledge into students in their usual practice courses. It not only improves the quality of engineering practice courses but also plays a positive role in the comprehensive development of students.

In the context of the epidemic, it has withstood the test. Compared with the previous course model, the course has been presented to students in a new way, and the quality of course teaching has also been improved.

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BIOGRAPHICAL NOTES

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