A PRELIMINARY STUDY ON NEW TYPE OF REMOTE SENSING EDUCATION AND TRAINING SOFTWARE: DISCUSSION AND SUGGESTION

ZHU Liying[a, b], HU Zhuowei[c*]

[a]Chinese Academic of Surveying and Mapping, Beijing 100039, China - zliying98@sina.com
[b]Beijing Geo-vision Technology Limited Company, Beijing 100039, China
[c]College of Resources Environment and Tourism, Capital Normal University, Beijing 100037, China - huzhuowei@gmail.com

ABSTRACT:

The current remote sensing experimental teaching lacks excellent teaching software. Considering this problem, a systematic design thought about remote sensing curriculum experimental teaching software was introduced in this paper. We analyzed the current situation and problems of remote sensing experimental teaching, and at some aspects such as strengthening theoretical study, implementing inquiry learning, application of information and visualization. On this basis, a design idea of developing remote sensing experimental teaching software was put forward.

KEY WORDS: Computer-Assisted Teaching, Joint- Education, Image Understanding, System Integration, Decision Support

1. INTRODUCTION

Remote sensing is an important course of relative majors (e.g. GIS, Surveying and Mapping) in universities. With the more wide application of remote sensing technique, each kind of remote sensing technique trainings becomes the compulsory course to geographer and geography related researchers.

The remote sensing has multiple characteristics including the abstract theory, the utility method and the practical technology etc. So, in the teaching implementation process, the experiments may play the influential role. However, whether in the remote sensing curriculum teaching or skill training, we still face the problem that there is being lack of outstanding software for experiments and trainings.

In recent years, National Educational Teaching Demonstration Centre of Geographic Science and Technology of Capital Normal University (CNU) carries on the education reform of remote sensing curriculum. For the sake of improving undergraduate course quality and deepening education reform, in this article, from the theory perspective we analyzed the present situation and problems of remote sensing curriculum, discussed the thought about carrying on the teaching software systematization design that provided the basis for the remote sensing curriculum educational reform and practice.

2. PRESENT SITUATION AND PROBLEMS

2.1 Emphasis is put on practice, but theoretical discussion lacks

In remote sensing curriculum, now more and more people pay attention to the experimental teaching activity. Along with the experimental equipment level's promotion, universities fulfil the remote sensing experimental teaching requirement generally through the purchase of commercial software (Liu, 2007). However, compareing with other majors, the remote sensing curriculum is lack of essential theory discussion and support in experimental teaching design and implementation.

Because of the experimental teaching's importance, the existing discussions about educational reform of remote sensing curriculum all involve experiment (Yu, 2003). However, as a result of analysis perspective, these discussions are too macroscopic to the concrete experiment teaching implementation as well as the related software design, which only have the guidance function. In fact, the experimental software design mode should follow some principles, such as from top to bottom, from macroscopic to microscopic, from the foundation to the practice, etc. It needs to consider content organization finally at the aspect of architecture and classification, and carries on the design to the specific requirement.

The experimental educational reforms in other majors may provide feasible suggestion to us. However, considering the difference between majors and the related characteristics, we did some research about the remote sensing experimental teaching theory, which was considered still very essential. The statistical data demonstrated that in the existing experimental teaching, the experiment of validation and demonstration type, which takes the auxiliary teaching of theory as goal, occupy more than 80% proportions (Fang, 2008). But practices proved that in the remote sensing experiment teaching, just those types of experiment content is neglected, which may be possible to affect the student to master elementary knowledge and its application in the operation experiment.

2.2 Some assistant experiment teaching software were realized and applied, but the theory and the practice still disjointed

Because of close connection between remote sensing and information technology, the experimental educational software was realized. But from the present situation, it show that these software still concentrate on simple process-demonstration experiment or operation experiment (Ma, 2003; Liu, 2007). It is difficult to change the traditional teaching method which has

* Corresponding author

the problem of taking teach as primary factor. The theory and the practice seemly all involved in the teaching design, but the two aspects were still separated from mutually.

The teaching goal of traditional remote sensing curriculum as follows: understanding the elementary remote sensing theory, grasping to the remote sensing major technique method, simultaneously applying these theories, methods and the technology to solve the actual problem in the work. The traditional classroom teaching method, combined with modern teaching techniques (such as projectors, courseware, etc.), make the dull theoretical knowledge more vivid, but when we explain methods and skills, the teaching method becomes dull because of lacking dynamic demonstration. Even if the application of computer animation tool for the production of special courseware, we also are facing heavy workload, long time-consuming, difficult to share, and other problems. Taking into account the geographic phenomenon of its own authenticity, the courseware we made with general computer animation software is difficult to guarantee the objectivity and accuracy. In practice teaching, we now use remote sensing software mainly as support, but in this method we are still difficult to get rid of the dilemma which is teaching technique only for technique and lacking teaching case, in addition, the common software operating is cumbersome and data format is difficult to be converted and unified, both of these difficulties impact on the scalability and sharing of practical teaching.

2.3 Investigative study has been put some attention, but the implementation difficulty is big

For adapting current and future social development demands, and culture high quality talents which have the innovation ability and the research ability, universities proposed generally inquiry learning, the remote sensing curriculum teaching is also not exception.

The one of key factors of inquiry learning is to adjust the positional relationship between teachers and students (Yu, 2003). Based on the constructivism theory, the role of teachers is to provide a better learning atmosphere for students. The implementation of experimental education and the establishment of experimental environment are beneficial to culture students' innovation spirit and practice ability (Chen, 2002). However, because of the lack of remote sensing teaching theory and outstanding resources (including software), the implementation of inquiry learning is difficult.

The practice shows that students generally invested more interests to the operational experiment whose process and the result are direct-viewing. From this point, it seemed that this achieve the goal that student mastered a technology (software) has satisfied the future to work the demand, but was not the university personnel training goal obviously. To cater to student's study interest, the present situation is that remote sensing curriculum experimental teachings often establish so many process demonstration experiments and operational experiments, but neglect the theoretical knowledge study with the experiment teaching auxiliary.

The important thing of inquiry learning is to improve students' ability of discovering and solving problems. The practice has proved that the inquiry learning would meet the reaction in and affect the student to explore the elementary knowledge and theory; moreover inquiry learning can not substitute the basic theory teaching. If the lack of elementary knowledge, we cannot master the basic study method and know the specialized essential feature, the direct result is we would never ask questions about special, or ask some questions with no sense, or we would find the feasible solution to questions with difficulty.

Therefore, teaching theory is not only the crucial point of remote sensing experimental teaching, but also is the difficulty of it, and at the same time it is the neglected step by the experimental teaching ever since. How to enhance the interest of basic knowledge for students and how to discuss the basic theory are playing an important role in the software design of experimental teaching. We not only rebuild the experiment of the theory's demonstration and validation, but also develop the new experimental model for the services of theoretical study. The final purpose is to build a comprehensive, systematic, comprehensive environment for studying remote sensing.

2.4 Analysis to other problems

A good teaching design is an important base to the teaching implementation. In the certain extent, the traditional experiment teaching design, as a part of the remote sensing curriculum teaching design, destroyed the systematic characteristic of the experiment teaching, and it also causes the detail instruction lacking for the software design of the remote sensing experiment teaching. The teaching design should follow the teaching method of construction principle--takes the students as the centre, takes the significance construction which students regarding knowledge as the goal of learning process, establishes the advantageous situation for the significance construction, thus it provides the evidence and the mentality for the software design of remote sensing experiment teaching.

In addition, the current remote sensing experiment teaching also has a problem which lacks the effective experiment evaluation link. So, uses the other teaching experience of special courses fully, especially basic experiment courses, designs and promotes the system for experimental report, can not only provides evidence for experiment evaluation, but also as an important component of the investigative experiment learning environment.

3. DISCUSSIONS ABOUT THE DESIGNING OF EXPERIMENTAL TEACHING SOFTWARE

3.1 Software design idea under the support of systematic theory

Aiming to the phenomena that Remote Sensing experimental teaching lack of theory study, we applied the educational and experimental theory in analyzing question of teaching type, objectives, implementation and evaluation of Remote Sensing education. The problem lacking of criterion and quantum evaluation index was resolved. It was improved that the theories of implement, foundation, manipulation about Remote Sensing experimental teaching design. It supplied theory direction to Remote Sensing experimental teaching software.

Current Remote Sensing experimental designs are emphasizing particularly on operation and practice (the implication of practice). However, on the viewpoint of pedagogic, the aims of experimental teaching in college are three aspects briefly: 1) enhancing the sensible cognition, make the students accepting and understanding the knowledge they have learned easier; 2) theory contact with fact, consolidating and strengthening the

knowledge they have learned; 3) fostering the students integrative ability about experimental skill, observing, analysis and judgments (Deng, 2000). It is obvious that experimental teaching should focus on the hierarchy of study, serving a whole study process from theory to practice. It is difficult to indicate the requests in processing management of modern teaching in practice because of emphasizing the application of aims unilateral, but ignoring the implement of aims in fostering process.

Combined the hierarchy with systematization, taking the types and objectives as bridges, the theoretical system of Remote Sensing experimental teaching should be established. They are propitious to achieve the aim that Remote Sensing experimental teaching serves the persons who are studied on RS specialty. Especially in study of theory, it aims at the teaching emphases and difficulties such as abstract in spatial phenomena, integration of spatial data, and complexity in spatial arithmetic. Researching the proper developing techniques and experimental explore, can establish foundation in setting up the practice teaching and investigative studying environment.

3.2 Facing investigative study, applying constructivism theory to build the environment of experimental teaching software

Considering the widely application of RS techniques; we should push the investigative study in teaching innovation energetically. However, investigative study should not be too impatience. It cannot disobey the rule in knowledge accumulation. Investigative study must be based on the theory teaching. Constructivism theory offers good foundation and advices to investigative study.

Looking student as centre, taking the knowledge building as the aim of students' study process, the design pay attention to things like "confirming the foundation of theory", "acquainting the methods and theory ", "mastering the procedure of method and techniques" in RS experimental teaching software . In terms of perceivable characteristic on people that are taught and trained, sucking the basic theoretic in educational psychics, blending the investigative study idea, putting forward the all-around and designing concepts, we designed the Remote Sensing teaching soft function considering these aspects: related theory, understanding about methods and principium, experimental in school or at home, analyzing the case，solving the problems.

We aim at the characteristic of study environment (comprehensive, flexible, operable), and considering the secondary development mode in commercial Remote Sensing software could not totally satisfy the request in investigative study, we brought forward the idea: adopting the excellent software to design the system frame and function on RS experimental teaching, meanwhile, integrating the function interface of commercial software. When designing the software, we setting up the system of "RS modelling" and fostering the ability of resolving the problem, adopting icon flow interface, coupled with experimental report, inspired the learners' studying interests, fostering the ability of find problem, analyzing the problem and solving problem, advancing their enthusiasm on study. In the process of software designing, we also considered opening, universality and sharability of software, and implemented script environment. We keep the standard of common software, and then have the simple flexible characteristic. By setting up resource storeroom, case storeroom, the request of sharing the teaching fruit and consummating the study environment was satisfied.

3.3 Utilizing the characteristic of informational and visualbility of remote sensing technology

The designing of the Remote Sensing experimental teaching software, especially aimed at the content about basic theory, we should consider the abstract of spatial and the complexity of spatial arithmetic make good use of the characteristic of videotext in Remote Sensing and spatial information technology. At the same time, we should conquer the blankness, engraftment existing in the demonstrating experiment; design the new type function in theory experiment: manipulation, demonstration, designing.

We considered that the key point to solve the problem, which is got by analyzing students have not interesting in the validate experiment in other major basic experiment, is to disentomb explore in validate experiment, by using alternant planning questions, make the students learn to think. Therefore, by combining the characteristic of information technologies in Remote Sensing (GIS), designing the function of validate experiment scientifically. Using the videotext and programmed characteristic of Remote Sensing and GIS, designing the operational validate experiment function, combining with the validating, operating, designing, inspiring the interest of students, upgrading the motivation of study, enhancing the thought on the result of experiment. By using the designing of the experiment report, leading the students complete the memory, understanding, thinking and application, even enlarging on the basic theory.

3.4 The suggestion to the implementation of experimental teaching

The students would bring idleness in problems thinking because of the advantage offered by the experimental teaching software. Therefore, we give these suggestions: consummating the function of the teaching software continuously, enhancing the teaching designing in experimental course, especially combining accomplish about students' experimental report, enhancing the assessment on experimental teaching.

The designing of experimental report is emphasized particularly on the thinking of experiment (including theory itself, such as related parameter, the thinking on validation of theory, such as different coding types have different capability on different characteristic images; how to identify the vegetation by using different spectrum characteristics, etc).especially in demonstrating the theory and designing of the validation experiment, we should better decrease the effect of using the software on the knowledge cognition, and pay attention to the discussion about the theory.

Therefore, when designing the experimental teaching software, we should pay attention to lay out expediently the correlative knowledge on the function of software (parameter setting, contrast of results). For example, theory about the analysis method of union, software should display the location, attribute of the features, emphasize on the discussion between calculation process and results by graphics results and attribute results. We should use them to analyze geometry theory and final result, in order to reach the aim of growing on the understanding of method theory, function, parameter and methods.

4. REFERENCES

Deng G.H., 2000. Probes into the reform of experiment teaching. *Journal of Chongqing Institute of Technology*, 14(6), pp.55.

Chen L., 2002. Applying a constructivism theory in Experiment courses. *Laboratory Research and Exploration*, 21(5), pp. 17-18.

Ma J.J., Yin Z.E., 2003. Designing and application of CAI to the course of "An Introduction to Remote Sensing". *Journal of Shanghai Normal University（Natural Sciences）*, 32(4).

Yu D.M., 2003. Application of research study in remote sensing teaching. *Journal of Teachers College Qingdao University*, 20(3), pp. 68-71.

Liu J.L., Wan Y.C., Ma J.P., 2007. Design and application of the assistant teaching system for a series of remote sensing courses. *Research and Exploration in Laboratory*, 26(3), pp. 78-80.

Fang Y.H., Song Q., 2008. On the university experiment teaching reform in the era of knowledge-based economy. *Technology and Innovation Management*, 29(1), pp. 30-32.