Education Technology of Remote Sensing Geology base on IITC

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KEYWORDS: Education, Remote sensing, IITC

ABSTRACT: Based on IITC, remote sensing geology educational technology is the association of Computer Multimedia Courseware and the Internet. Under the support of its two-way functionality, the courseware has infinite teaching freedom and developing space, which becomes the public welfare network platform of the free RSG education for the whole society.

1. Background

Today, Remote Sensing Technology is developing for an unprecedented speed. Remote Sensing platform of a variety of next-generation Earth observing continuously send observation data to Earth form deep space, with the order of magnitude rate of TB per hour. Taking high resolution, high spectrum, multi-criteria, multi-polarization, multi-origins, high synthesis and 3S integration as characteristic, remote sensing technique application has extended to almost fields, related with geo-spatial information. Consequently, as Remote Sensing technique important component, how should improve Remote Sensing Geology Education in order to meet the 21st century training needs of geology professional? Adopting the computer multimedia courseware and the network curriculum reform the teaching way, develop the teaching space, it is an effective way. Regarding this, the authors have carried out exploration and research.

2. Curriculum teaching technical feature

Remote Sensing Geology is a compulsory course for the geological major, its object of study is the earth's surface, the geologic body of surface layer and the different characteristic of electromagnetic radiation and reflection of geological phenomenon (Zhu Liangpu, 1991). There are mainly the following four aspect characteristics for the curriculum teaching technology:

To begin with, the curriculum has the crossover studies nature, namely the crossover of traditional discipline geology and high-tech discipline spatial information technology. The research content develops faster and fresher.

Secondly, the curriculum knowledge apprehension greatly relies on visualization expression of the object of study and the research content. That is because that electromagnetic wave as the major research object of curriculum is an amorphous physical field. Visualization is the best way to reveal its materiality, the space and time characteristic and the law of motion.
Once more, teaching depends on massive multiple remote sensing image data, including: multiple terrain feature phantoms, multiple spatial resolution phantoms, multiple multi-spectrum phantoms, multiple time phantoms, multi-image processing and multiple application, and so on. 
Eventually, Curriculum central content, remote sensing geological interpretation teaching, strongly depends on the rapid response integration comparison form. Therefore, the teaching needs the massive remote sensing phantom material. Moreover, it also needs massive non-remote sensing material, involving Geo-graphics, images and pictures.
These four aspects for the curriculum teaching techniques features is the objective point of remote sensing geology innovation. (Wu Hong, 1996, 1997,2003 )

3. IITC

IITC is the abbreviation of Integrating Information Technology into the Curriculum (He Kekang, 2005). The remote sensing geology teaching adopts the IITC necessity, which can be proved by the analysis comparisons of the teaching technological for the remote sensing geology. There are three stages following:
The early stage (the1970s and 1980s): The teaching is short of the computer support, and the classroom demonstration can only rely on the remote sensing wall map, the atlas, the reverse slide show, the projector and the stereoscope, and so on. The visual geological interpretation and the manual charting are the main experiment forms. The optical image processing technology was once the dominant technology. Even if it was, it would not be popular. Yet, the digital image processing technology is far away from teaching because the technology is expensive and scarce. Therefore the teaching of this stage is the teaching that uses the backward method for the advanced technology. For that matter, students study hard, undertake passively and, teachers teaching inconveniently.
The interim stage (the 1980s and 1990s): Digital image becomes the major format of the remote sensing information source. The remote sensing digital image processing system which is based on the microcomputer enters the remote sensing teaching. The classroom image display of remote sensing can demonstrate by the compute CRT or the computer slide show. Quantitative remote sensing has become an important new learning content. The information visualization makes the teaching of remote sensing geology more intuitive. At the same time, the learning interest is increased, and the initiative is enhanced. But the isolated computer or computer system can only provide the limited teaching resources which memorizer saves. That makes the students’ sensation space restricted. So although it drives the teaching progress by using computer, it is limited because of the above reasons.
Nowadays (the beginning of this century to now): Namely the so-called IITC teaching stage. They, which are the remote sensing geology investigation of high resolution and high spectrum, the 3S digital plotting, the precise positioning remote sensing, the advanced image process, and the acquisition and utilization of the remote sensing information under the network environment, become the main body of curriculum knowledge. Multimedia comes and there are charts and also acoustic image for the teaching forms. Through the Internet, we can obtain infinite resource of teaching, open up the infinite hypothesized teaching space. The teaching effect depends on the utilization of the remote sensing geology knowledge and the quantity, quality, speed, visualization level and network level of the image date. We can build up an environment of the digital remote sensing geology teaching, which takes the students as the main body, takes the
teachers as the dominant.

Figure 1 is the progressive relation for the three stages of the teaching technology development.

Conclusion: Teaching based on IITC is the development direction of the remote sensing technology.

<table>
<thead>
<tr>
<th>Teaching for the Initial period</th>
<th>Teaching for the Intermediate period</th>
<th>Teaching for the current period</th>
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<tr>
<td>wall map, hard copy images (involving the atlas and slide show) and stereoscope, and so on</td>
<td>Stand-alone based on computer/the RS Image Processing System of LAN + RS image database</td>
<td>The integration of computer multimedia courseware and Internet - the teaching based on IITC</td>
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</table>

Figure 1 The three stages for the technology development of the remote sensing geology teaching

4. Remote sensing geology courseware

**Definition:** Computer multimedia courseware, which the abbreviation is courseware, is the teaching material form of the multimedia teaching information with the chart, text, sound, image and the form, etc. It carries on the integration, the edition and the management following the program of instruction, the plan of instruction and the teaching method requests. On this basis, we can establish the teaching function with the scientific visualization. Then it accomplishes the multimedia teaching software of the specific teaching task by assistance.

Remote Sensing Geology multimedia courseware, which the abbreviation is Remote Sensing Geology courseware, is the computer multimedia courseware, which is according to the curriculum content, the curriculum characteristic and the knowledge logical structure of Remote Sensing Geology.

Remote Sensing Geology courseware is the teaching technique core of remote sensing geology IITC. Developing remote sensing geology courseware is the starting point of the remote sensing geology educational technique platform based on IITC.

**Software support:** Nowadays, there are lots of software for making courseware, such as PowerPoint, MicroAdobe PDF Editor, Macromedia Authorware, Macromedia Flash, Macromedia Dreamweaver, FrontPage 2000, Director, FOUNDER AUTHOR TOOL, Mengtai-Yaoguang Multimedia Editing System, Kaidi multimedia authoring tool, Geometry Sketchpad, Mathematical platform, Z+Z Intelligent Education Platform, and the so-called CloudFree technology. The author uses Flash for software platform to make remote sensing geology courseware. Because of it is not only appropriate for desktop computer, but also for webpage making. Then we can surfer the Internet with the courseware. Consequently, we prepare for establishing network curriculum of remote sensing geology.

**Design:** The design of remote sensing geology courseware takes the curriculum content as a core, and links curriculum unit and database document by functional module. It is the structural level of central combination, which can transfer chapter content by layer-built tables. As shown in Figure 2.

**Teaching approach:** Teaching approach is the method that is in light of the law of teaching, teaching requirement, teaching experience to organize the teaching process. And it runs through every part of production. The courseware design is used to the traditional teaching method. Besides, targeting the teaching characteristic, the author uses the innovative teaching method, which is situation guidance, comparative analysis of sky-ground as whole, multi-source information integration, virtual experiment, over time-space interactive analysis.

**Module and resource:** The courseware has nine functional modules, including course syllabus,
curriculum, animated simulation, video image, practice test, scientific practice, knowledge development and the help. There are 13 chapters of theoretical seminars, 12 foundation experiments, 56 Self-made animations, 29 videos, 724 Remote Sensing Images, 263 photos, 413 charts and 271 tables. It also links 52 related websites.

**Content layout:** The curriculum content takes "Remote sensing Geology" (Zhu Liangpu) as chief source, and it puts in massive up-to-date achievements in scientific research at home and abroad, also the author does and the students do given by the author. The teaching content mainly reports the level of the remote sensing geology development at the beginning of the 21st century. As shown in Figure 4, it is the content layout of curriculum branch.

**Characteristic:** Firstly, based on IITC theory and the teaching, the remote sensing geology courseware follows the teaching law. It carries on the scientific visualization simulation reflection, for the important concept, basic theory, key technology, complex relationship, process change and the model application of “Remote sensing Geology”.

Secondly, it possesses rich remote sensing images, animations and experiments, including 56 animations, 29 videos, 724 Remote Sensing Images, 413 charts and 263 photos.

Thirdly, it highlights the teaching characteristic, changes the key teaching link, such as concept understanding, computer operating of image processing, principle of the information processing, geological interpretation and prospecting forecasting, for the intelligible interactive visual simulation.

Fourthly, using the fresh technological achievements of the earth observation, especially the home up-to-date remote sensing application achievements, prominently reflects the latest progress of remote sensing geology in the 21st century.

Lastly, it establishes a demonstration module, motivating students to research and innovate. Then we provide the technical support for setting up the “digital remote sensing geology” teaching environment taken the students as center and the teacher as leadership.

**Main function:** i. Multimedia integrated visual teaching of theory course of 13 chapters.

ii. Animation simulating. There are 56 animations, which include physical principle of remote sensing, remote sensing digital image processing, remote sensing explanation for geomorphology, layer, eruptive, degenerative, degraded rocky, geological structure, geological minerals prospecting, ecology and environment, natural disaster as well as principle and application of GIS, etc. iii. Database and knowledge-base. There are 8 Database and...
knowledge-base, which include base of remote sensing images, base of reflection spectrum of rocky and mineral, base of references and literatures, base of net resource, base of research achievement of students, base of research achievement of teachers, base of specialist’s academy report and exercise for examination self. iv. Linking 52 correlative nets. v. Can read content of the whole book with Flash format, and provide navigation for help how to use the course ware and, have the blackboard to free writing and smeared, etc.

5 Net course based on IITC

Net course and perfect course: Linking the remote sensing geology course into the internet and offer free study, making education of remote sensing geology becomes public education, that is, setting up a net course of remote sensing geology base on Internet. The net course of remote sensing geology as bi-directions function, that is, function of output course knowledge to outer society and function of getting dynamic information from outer world through internet, thereby making remote sensing geology has not only powerful ability from computer multimedia course ware, but also limitless teaching freedom and exert space from internet. Therefore, the net course of remote sensing geology technology is best realization of IITC education technology.

According to The Active Plan for Developing Education for 2003 to 2007 drew by Chinese Education Ministry, Chinese universities have carry on the proje ct of teaching quality and teaching reform, which aimed for establish perfect course (abbreviation is quality engineering). Aim of this plan is that transform relate content of the perfect course into internet and free opening, to realize excellent education resource and share together, so that upraise quality of teaching and personnel training in seminary.

Undisputed, here building perfect course pointed in the active plan is namely building net course from technology angles.
Relations between courseware and network course: Perfect course of remote sensing geology is an integration of various teaching function modules, the courseware is only one part among it. A whole course base on network should includes teaching course, teaching video, teaching plan, guidance of experimentation, knowledge extending, achievement of science research and application files, etc. Perfect course is a set compose with many teaching function module subsets that can make super connection in net. Among it the course ware is a subset but as core. The writer had ever tried to establish relation between course ware and net course through by using level structure model, but having no progress up to now. However, in a word, establishment of a perfect course need more supporting conditions than a course ware and, expend more work, time and money, in spite how to describe relation between course ware and net course. Which determents need walking a long road when we want to develop a course ware becoming a net perfect course.

Be building net course of remote sensing geology: Writer’s computer multimedia course ware of remote sensing geology had wined a top grade prize in national game for computer multimedia course ware (university science system), 2007, which provides an important matting to establish the perfect course remote sensing geology base on Internet. Establishment of our perfect course of remote sensing geology base on Internet has undergone two stages, that is, 2008: stage of perfect course of Guangxi province level; 2009: stage of applied perfect course of Chinese national level; the below is four interfaces of perfect course of Guangxi province level; if you want to know more about this net perfect course, can see web: http://www.gxedu.gov.cn/2008/10-27/164256.html.

6 Conclusions

The network course of remote sensing geology base on internet is technology realizing of IITC teaching of remote sensing geology. The network course of remote sensing geology that centered on computer multimedia course ware has not a style of one’s own, but huge teaching freedom and exerting space, so possess bi-directions function, that is, dynamic output knowledge, dynamic acquire knowledge and alternation of education. Which has became a commonweal and free education plant for the whole society to open. So, net course of remote sensing geology is best reflection to remote sensing geology base on IITC.

References