Discussion on the Practical Teaching Mode of Geographic Information of System Course

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Abstract: With the increasing demand for high-quality applied talents in society, universities are gradually strengthening the process of cultivating students' learning and practical abilities.The practical teaching of Geographic information of systems has a wide range of content and a large amount of information. Through limited practical teaching hours, students can obtain more systematic skill training. This article focuses on the common problems in practical teaching of GIS courses, and combines professional characteristics to add experimental software platforms, optimize the experimental teaching content system, pay attention to comprehensive and designed experimental projects, fully explore the ideological and political elements of the course, and explore the reform of GIS course practical teaching, in order to improve the effectiveness of practical teaching and play a constructive role in professional talent cultivation and subject development.

Key words:GIS; technical system; Practical Teaching Mode

1. Introduction

Geographic information of system is a technical system that, with the support of computer hardware and software systems, collects, stores, manages, calculates, analyzes, displays, and describes geographic distribution data in the entire or part of the Earth's surface (including the atmosphere) space. The purpose of offering military Geographic information of system courses for non Geographic information of system majors is to enable students to understand and master the basic principles and methods of Geographic information of systems. Through practical teaching, students are equipped with the ability to use Geographic information of system related software for data collection and processing, compilation of maps, data warehousing, comprehensive analysis, and data visualization, in order to strengthen their ability to solve geospatial problems. This article summarizes the problems in practical teaching during the construction of GIS courses for non GIS majors, and proposes reform suggestions for practical teaching to improve the quality and effectiveness of practical teaching.

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2. Content of Practical Teaching in GIS Courses

Due to GIS being both a fundamental theoretical science and a highly applied technical science, both theory and practice must be emphasized in teaching. While teaching students theoretical knowledge, emphasis should be placed on cultivating their practical abilities.The Geographic Information of System (GIS) course comprises a total of 60 hours, with 32 hours dedicated to practical teaching. The focus is primarily on utilizing the ArcGIS software platform to conduct relevant experiments[1]. The specific content includes:

A.Understanding the composition and architecture of ArcGIS software.

B.Mastering the ArcMap window interface and basic operations.

C.Learning how to project geospatial data, coordinate establishment, and transformation in ArcMap.

D.Acquiring skills in collecting spatial data in ArcGIS and performing data structure conversion.

E.Creating Shapefiles and spatial indexes in ArcCatalog.

F.Vectorizing maps, establishing geographic databases, and implementing spatial indexing in ArcGIS.

G.Utilizing ArcToolbox for spatial data quantitative calculation, stacking analysis, buffer analysis, window analysis, and network analysis.

H.Conducting DEM (Digital Elevation Model) establishment and model conversion, terrain characterization based on DEM, watershed analysis, hydrological analysis, and other data processing operations.

I.Mastering three-dimensional analysis and visualization using ArcGIS surface analysis tools.

J.Gaining proficiency in ArcGIS operation visualization, vector and raster symbolic operation, and thematic map production and application.

K.These practical sessions cover a comprehensive range of GIS operations and applications, providing students with hands-on experience and skills.

Table.1 Teaching Content Arrangement of GIS

Chapter	Practice Hours	Practice Content
Introduction	2	Understanding the ArcG1S Interface and Its Functions
Geospatial basics and map projection	2	Definition coordinate systems, registration, and transformation Spatial data model
Spatial data model	0	
Space data structure	2	vectorizing raster maps
Spatial database	4	Create Shape files, geographic databases and feature sets, and line feature classes
Space data collection and processing	6	Establish topology, search for editing errors, and create spatial data
GIS basic spatial analysis	8	Superposition analysis between points, lines, and surfaces; Buffer analysis; Establishing a network

		model and solving the shortest path
DEM and Digital Terrain Analysis	4	Establishment of DEM and analysis of terrain features, watershed analysis, and hydrological analysis
Spatial Data Visualization and Mapping	4	Special Map Production and Mapping

In Table 1, the main content and schedule of GIS course teaching are presented.The G1S course is a highly practical course, and practical teaching plays a very important role in this course. Many contents such as data collection, editing, spatial analysis, and thematic map making must be mastered and understood through practice. Among them, spatial analysis, DEM, and digital terrain analysis are the key contents of the course, with strong applicability[2]. The teaching combines emergency management, disaster rescue and other tasks to carry out work. In the practical teaching process, a large number of disaster and emergency management case studies are supplemented with practical experience, guiding students to understand and master the principles and applications of various analysis methods.

3.Current Status of Practical Teaching in Geographic Information of Systems

3.1.Single Method of Practical Teaching

In the teaching process of GIS courses, the practical teaching content is mainly based on the ArcGIS software platform, ArcGIS should be used as an auxiliary means of practical teaching, but it has become the main body of teaching, which has a great limitation, most of the students' understanding and knowledge of GIS is based on the knowledge of ArcGIS, and their grasp of the basic principles of GIS is not so satisfactory, and their mastering of basic GIS skills is mostly confined to the software operation, which cannot comprehend the essence and essence of GIS courses. The students' understanding and knowledge of GIS are mostly based on the knowledge of ArcGIS, and their grasp of the basic principles of GIS is not so good, while their mastery of basic GIS skills mostly stays on the operation of software, which makes them unable to understand the essence and essence of GIS courses[3]. And the practice session is generally arranged in each chapter of the corresponding theoretical teaching, although it helps students to better understand and master the theoretical knowledge, to complete the combination of theoretical knowledge and practical content, but because the data used in practical teaching content are known practice data, the practical steps are relatively simple but students lack of systematic thinking, and are guided by the teacher's demonstration to complete the process of teaching methodology is relatively simple, resulting in students' understanding of the knowledge. The teaching method in the teaching process is relatively single, which leads to the students' understanding and cognition of the knowledge is mostly in the simple ArcGIS software operation state, and can't deeply understand and comprehend the practical content in order to be integrated.

3.2.Lack of Systematic Design

The practical teaching mode of GIS course is mainly based on verification practice, which aims to verify the basic theoretical knowledge of GIS learned in the classroom through

practice, and to improve the students' professional cognition; and the comprehensive and design practice combined with professional application is less arranged, which can't cultivate the students' ability to analyze and solve the professional problems by applying the theoretical knowledge well[4]. In the practice teaching link, different chapters are set up with corresponding practice teaching content, but the practice of each chapter is independent of each other and lack of connection, the practice teaching provides different types and sources of practice data, and can not be closely related to the teaching content of the previous and subsequent chapters or clarify the interrelationship, resulting in the practice of each chapter is scattered and independent, rather than considering the application of GIS based on the completion of the systematic practice teaching, which makes the students to apply theoretical knowledge to analyze and solve professional problems[5]. As a result, the practical content of each chapter is scattered and independent, rather than being designed based on the application of GIS, which makes the students' mastery of practical teaching only remain in the understanding of the knowledge of each chapter rather than the systematic mastery of the practical teaching of the course, and lack of systematic knowledge and control of the data processing operation in the later work practice.

3.3.Lack of Rich Practical Teaching Cases

The practical teaching of GIS courses is mainly based on explaining the practical principles and demonstrating the practical operation steps, which leads to the practical classes easily become a formality, is not conducive to the realization of the practical teaching objectives, and can not effectively cultivate students' practical and innovative abilities, and the explanations for the courses involving relevant professional background knowledge or surveying and mapping, cartography and other related disciplines are relatively less, which makes the students not understand certain contents of practical courses deeply enough due to insufficient in-depth understanding of the relevant professional background knowledge[6]. As a result, students do not have a deep enough understanding of the contents of certain practical courses due to the lack of in-depth knowledge of relevant professional background. In the practical classroom, students need to deepen their understanding and mastery of the basic theory of GIS through practice, and further deepen their knowledge in brain and hands-on activities[7]. However, in this process, most of the students make use of the readily available data, follow the operation steps demonstrated by the teacher, refer to the practice guidebook, and do the practice in a routine manner, seldom linking each operation step to its theoretical knowledge behind it, which makes the effect of the practice unsatisfactory, and leaving the practice guidebook, it is difficult to utilize GIS in the practice. The practical effect is not very satisfactory, leaving the practice guidebook, it is difficult to use the basic methods and basic skills of GIS to solve practical application problems; at the same time, this mode of teaching is also relatively boring, not easy to stimulate the interest of students in practice, not conducive to play the initiative of students, restricting the development of students' innovation ability.

4. Exploration of Innovative Modes of Practical Teaching

4.1.Increase the Software Teaching Platform

With the extensive and in-depth application and development of Geographic Information of

System technology, a variety of Geographic Information of System software at home and abroad, for the practice of teaching platform software single problem, in the course of practical teaching process, can not be limited to the operation of ArcGIS application teaching, should be more than two or three commonly used Geographic Information of System software, such as ArcGIS, MapGIS, MapInfo, MApGIS, etc., to broaden students' learning horizons, making students master a variety of software operations to better understand the advantages and disadvantages of different types of software[8]. In the teaching process of the course can be in the same practical project to explain and demonstrate the two software, such as allowing students to use ArcGIS and MapGIS software to complete the preparation of topographic maps of a region, in the practice process, remind students to think and summarize the steps of the operation process of the different software, there may be problems and solutions to the problem, in the practice of the completion of the teaching task, the students will be profoundly appreciate that Although the steps of practical operation may be different based on different software platforms, the processes and ideas of data processing are similar, and different software have their own advantages and disadvantages, which can be mastered and applied more flexibly in the process of future use.

4.2.Task-Driven, Optimize Design of Practical Teaching Content

According to the talent cultivation plan and teaching syllabus requirements, optimize the design of practical teaching content, and strengthen the ideological and political construction of courses[9]. Through introducing cases such as the construction of digital cities and digital campuses in China, the application of Everest elevation measurement, GIS in epidemic prevention and control, as well as the glorious deeds of older generations of scientific researchers such as Li Xiaowen and Li Deren Academy in scientific research and serving the country, we actively educate, guide and motivate young students to establish a correct outlook on life and the world Values.According to the characteristics of the course, the practical content of GIS course is divided into three levels, training practice, comprehensive practice and analytical practice. Training practice is mainly based on spatial data acquisition and editing, data management of geographic database, map mapping, so that students have a certain understanding of the mainstream GIS software at home and abroad, deepen their knowledge of geographic information and GIS, and become proficient in the basic operation of 1-2 kinds of GIS software, the method of data processing, and in the process of learning the software, appropriately add the content of the development of our country's GIS cause achievements, such as the The cases of "Red Army Long March GIS", "Belt and Road GIS", "China's historical and cultural heritage GIS" and so on are added into the practical classroom, which help to strengthen students' national honor and cultural confidence and stimulate their patriotic feelings. The purpose of comprehensive practice is to cultivate students' practical ability and train them to combine the principles and methods of spatial analysis and theoretical knowledge of other courses that they have already learned to solve the practical application problems of GIS in different fields. For example, to solve the problem of selecting the location of a large shopping mall by using the buffer analysis and superposition analysis of vector data is usually carried out in the form of a team or a group, and students are grouped in groups of 3-4 people to discuss and design the practical program to cultivate students' teamwork and responsibility. The purpose of analytical practice is to cultivate students' innovation ability and train students' spatial modeling ability, such as analyzing the relationship between regional economic development and regional population, society, nature, economy, culture and other

elements, constructing GIS application models according to specific application goals and problems, improving students' analysis and problem solving ability, and improving students' ability to analyze and solve problems by citing examples in scientific research fields, such as digital city, e-map, home-made database software, and Beidou system development. By citing examples of digital cities, electronic maps, domestic database software, and Beidou system development and other scientific research fields, the course allows students to recognize the important role of GIS in the construction of the national economy and scientific research, and to appreciate the commonness and greatness of China's scientific research workers, so that students can establish a professionalism of love and respect for their work.

4.3.Project-Led, Well-Designed Teaching Cases

Case teaching is uniquely advantageous in training students to analyze and solve real-world problems, so the practical courses can appropriately adopt the case teaching method. Case teaching is guided by problems and aimed at solving problems to maintain students' autonomy in learning. Starting from problems and using example units as carriers, combined with the teaching mode of "reading, thinking, solving, and using", it guides students to complete the entire project step by step, from simple to complex, from easy to difficult, and through solving typical case problems.In the design of teaching cases, the traditional practice teaching is teacher-centered, textbook-centered and classroom-centered to student-centered, project-centered and practical experience-centered, and the teaching content and objectives are skillfully integrated into the teacher's scientific research project tasks or case tasks, so that the task-driven teaching process progresses. Promote teachers' scientific research projects to expand into students' classroom teaching, such as in the chapter of spatial analysis with the flood rescue mission as the background, driven by practical problems such as distribution of rescue materials and rescue site setup, to design practical teaching links, through the study of the morphology of the transportation network, simulate and analyze the flow and distribution of resources on the network in order to achieve the optimal allocation of network resources, scientifically plan for the shortest or optimal paths, and Based on the results of this practice to complete the later chapters of the DEM data modeling and visualization analysis of practical teaching content, in the thematic map production practice, based on the above analysis of the completed data combined with roads, administrative districts and other basic data, according to the students' preference to independently complete the design and compilation of map symbols, not only to improve the students' ability of independent learning and application of the practice, and to enhance the connection and linkage between the chapters of the practical content, so that the students will be able to learn more independently, and to improve their ability to learn more independently. This course not only improves students' ability of independent learning and practical application, but also strengthens the connection and linkage between the practical contents of each chapter, which enables students to master the practical contents of the course more systematically and comprehensively.

5.Conclusion

With the progress of the times, higher quality talents can only be recognized by modern society. Universities are an important base for the country to cultivate talents and transport talents to society, and it is of great responsibility to improve the quality of teaching in

universities.Practical teaching is an effective way to consolidate theoretical knowledge and deepen understanding of theoretical knowledge. It is an important link in cultivating high-quality application technicians with innovative awareness, and an important platform for integrating theory with practice, cultivating students' mastery of scientific methods, and improving hands-on abilities.Compared with the traditional practical teaching classroom, it integrates the fragmented subject knowledge into the complex and changeable project teaching cases, takes the task as the background, takes the actual task demand as the traction, creates the suitable realistic situation, designs the complete "story line" project teaching task, optimizes the practical teaching content, fully explores the ideological and political elements of the practical courses, explores Various teaching methods are used to stimulate students' interest in learning, improve their ideological and moral level and cultural literacy, and form teaching cases that are in line with the reality of the post, so as to develop students' comprehensive divergent thinking, cooperation ability, and hands-on ability, promote their all-around development, and lay the foundation for innovative learning and lifelong learning.Reference

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