

# A Study of Information Literacy Training for Undergraduate Students

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## Abstract

Information Society requires every individual to have information application ability. Higher education is in charge of cultivating human resources who not only master specialized knowledge, but also have information application ability to solve problems with computer technology. Based on analyzing characteristic of information literacy, this paper develops a course to train the information analysis and application ability for undergraduate students, describes the constructed knowledge modules in an information system, teaching and evaluating mechanisms in detail. Teaching practice indicates it is an available and effective avenue to information literacy.

**Index Terms:** Information; information system; system analysis and application; teaching method; teaching content; teaching assessment

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## 1. Introduction

Nowadays, information system technology has already become a supporting technique for all kinds of fields, e.g. manufacture, business, science and our daily life. It puts forward critical needs for higher education students to have comprehensive information technology skills to exploit information value in their study and work.

Studying on the computer foundation courses for domestic university, we find that although some school offer courses relative to information system, but they are not aimed at information literacy for non-computing students. Some courses emphasis on theory of management information system, some on database technology and system implementation, some on database application with the software VFP and Access. Since the courses lack in construction of multi knowledge modules for information recognition, distinguish, organizing and application, it is difficult to reach the goal of information application ability training for students.

Concentrating on cultivating students' ability of organizing information resource and realizing information system, this study analyzes characteristic of information literacy, develops a course "information system and database technology" which support students to construct her or his knowledge base and application ability with multi knowledge modules including information system, software engineering, database and software

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developing. This course has been launched for years and gains welcome from students. During the teaching practice, we employ some effective teaching methods including case-based teaching, collaboration learning and blended learning.

## **2. Characteristic of information literacy**

In order to apply information system into specialized work, a student must have the ability to recognize, distinguish, organize information and construct an information system. The information literacy has the following characteristics.

- **Consciousness of computer application:** Computer technology is a tool that services one's major. A person who have a well consciousness of computer application would be easy to recognize the information processing needs arising from their work and apply information system into practical problems actively.
- **A comprehensive system view:** Information system is a Human-Computer system which is made up of hardware, software, data and also human being. By aggregating all these factors together to achieve a effective computer system in security.
- **Ability of designing information system:** In an information-based project, programming ability is not obligatory for a non-computing major employee since he usually doesn't work on programming, but it is very important for him to have the ability of making the project plan, describing the system requirements, and also running the project to cooperate with computer technicians. A person will do better in project management if he has the ability of system analysis and system design.
- **Ability of learning and applying computer new technologies:** Computer technology is developing so fast that a person should be able to study sustained since the technology and tools one has learned in school will be out-dated undoubtedly. Ability of IT including choosing adoptable method, technique and tools to solve the practical problems under guidance of systematic perspectives.

## **3. The course "information system and database technology"**

### *3.1 Course Content*

"Information system and database technology" is a course that aims at helping students to build up the consciousness of information resource application, learning the methods of information analysis and data modeling, understanding design principle of an information system, as well as the method of project development and management.

The course is different from the course of "management information system" for management major and also the course of "database theory and application" for computer major, which actually consists of the basic knowledge of these two areas, introduces the idea of software engineering and information system implementation with program language.

The course includes four knowledge modules including information system, database, software engineering and program design (as shown in Fig. 1). According to structural idea, it constructs these classical knowledge modules together to realize a series of work of analyzing, designing, developing and running information system.

The course selects popular and mature software environment and tools as its teaching prototype, for example MS SQL Server as DBMS teaching prototype and knowledge practice environment for database, MS.Net as IDE to develop application software. We also introduce editor tools such as MS Word and MS Visio for composing the design reports and technical documents.

It provides teaching material including some information system cases comes from the IT projects. It also introduces some new system design ideas and developing ways, such as the conception of information resource, data mining, resource outsourcing, system developing method and information system modeling method.

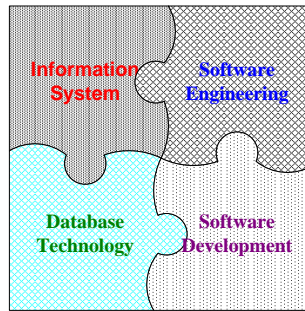


Fig 1. Basic knowledge modules of Course.

### 3.2 Course Construction

There are multi knowledge modules in the course, so it has to integrate them together and keep a balance between theories and practices, abstract concept and concrete techniques, complexity and difficulty, development and management to make all the parts serve to the course goal. In addition, due to the fact that computer technology is developing so fast, the teaching prototype of software and tools has to be changed to reflect the latest technology.

The course integrates contents containing thoughtway, theory, technology and application, which makes it follow the trend of international computer foundation education as well as meet to the requirements of human resources cultivation for national economy and social development. It has features as below:

- System-oriented view. It targets at higher level in computer application foundation course series, constructs the knowledge modules with a view of system-oriented. So it has pertinence to teach the students to gain comprehensive application ability.
- Integration of multi knowledge modules. Aiming at the ability of information application, it integrates information system, software engineering, database and software development four modules organically to make a new knowledge hierarchy different from other courses.
- Flexible teaching methods. We adopt the teaching methods such as cases-based learning, group-based discussion and project practice, blended learning with class and course website which help to promote learning effect.

The teaching task can be completed in 48 hours. The main knowledge modules and the corresponding arrangements are shown in the table 1.

Table 1 Teaching hours distribution

Teaching content d	48 teaching hours distribution		
	<i>Classroom teaching</i>	<i>Experimental teaching</i>	<i>Assignment</i>
1 Information system summary	1		
2 Developing method of information system	2		1
3 Basic knowledge of relational database	3		1
4 Relational database management system and Transact-SQL language	9	9	4
5 Relational database design method	2	2	2
6 VB.Net program design basis	2	2	2
7 VB.Net database application developing	4	4	2
8 VB.NET data report and graph	2	2	2
9 Information system comprehensive developing	2	2	2
total		48	16

#### 4. Implement diversified teaching methods

Constructivism is a world-wide known social-scientific theory, whose teaching theories become more and more popular in the field of education. Constructivism holds that teaching should be student-centered while the teacher should provide them with a comfortable learning environment (circumstances, cooperation, conversation and significant construction) for encouraging students to construct their own knowledge [1]. Constructive learning theory has been applied in the “information system and database technology” teaching practice.

##### 4.1 Case-based teaching highlight the establishment of system-objected view

Case-based teaching is conducted by the theory of constructivism. It encourages students to start learning with exploring phenomenon from specific to general and experience in real environment [2]. Usually in case-based teaching, we demonstrate a case to inspire students to learn and make them grasp perceptual cognition of knowledge. While teachers’ task in this teaching method is to require more in cases from the easy to the difficult, draw out deeper problems timely for them to think and discuss and make them master knowledge while solving problems [3].

Due to the fact that this course targets at teaching the students of non-computing majors, it involves several knowledge modules of computer and management subjects. In order to cultivate students’ consciousness of information application and ability to apply relative knowledge comprehensively, make them understand developing process and method from system analysis to system design and application, we generally adopt the case-based teaching method both in teaching theory and practice, which builds a system view for students and

relieves students from burdens of understanding theory and methods, makes the practice more convenient to be launched.

- We adopt an educational administration management system as a teaching case throughout the course, which is separated into approximate 160 examples to support knowledge teaching. We apply or justify a theory in the context of the case to achieve “one example for one knowledge point”.
- In the practice section, we also launch experiment that bases on a case of “textbook ordering system”. The experiment tasks include validated work and also design work. It follows the construction of teaching content and goes deeper gradually to make students digest and consolidate each knowledge point.
- Organize students to analyze some information system cases familiar to them, such as “student course-selecting system”, “ATM system”, “flight/train booking system”, “experiment material management system” etc. stimulates them to list the system functions, analyze the data schema and derive a available design. These exercises stimulate students to learn and study lively and actively.
- At the end of the course, students are required to finish a comprehensive practice projects in groups, which are brought forward and refined themselves based on the requirements of their study and life. A group is required to finish an information system including requirement analysis, system design and implementation by imitating the case. This help to train their ability to solve practical problems by comprehensively using knowledge in the courses and cultivate their team cooperation consciousness.

#### 4.2 Large amount of practice strengthen student's IT application ability

The ultimate goal of learning knowledge is to gain the ability to solve problems. It's important to guarantee practice teaching effectively because of the fact that only practices can plunge students into practical problem.

This course not only contains basic theories such as information system, database, software engineering, what's more, it requires students should be capable of starting from analyzing practical problems and building data schema to implement a information system based on database. So practice section should strengthen training of application system analysis and design ability on the basis of knowledge points.

The verification experiments in the course spread out from a case of “textbook ordering system” consistent with the theory teaching in each phase. The experiments come from the same case avoid unnecessary repetitive cognition burdens and thus make the students focus on accumulation of knowledge. Some students feel difficulty when they begin learning this course but as they practice further most of them will find it enjoyable and be motivated by constant progress.

Furthermore, the group project is a comprehensive experiment which stimulates students to integrate all the knowledge and methods they have learned to refine and solve a problem. They are also asked to finish technique documents according to the industry rules or national software development standard and give an oral report on their project. Students try to apply theories into practice and eventually achieve full understanding of overall of an information system, which also arouse students' desire and interest to learn new technique to achieve a better implementation.

#### 4.3 Cooperative learning accelerate

Cooperative Learning is the one that builds on the foundation of constructivism teaching theory. In team-based learning, group members can exchange ideas with each other, modify and deepen their understanding of problems through confrontation and complement. Cooperative Learning can assign cognition to every member thus makes them finish difficult tasks that can't be done by individual, it also cultivates students' cooperation spirit and ability [4].

Team cooperation is indispensable in realizing a large scale information system in high efficiency. Besides, there is no absolute right answer for an information system no matter in system design or system realization. Different designs show different requirements and realization features, different realizations also reflect different

knowledge points and system properties. In our course, a team is established by 2-4 students freely. Team cooperation cultivates students' ability of expression, discussion and deep analysis [5]. What's more, students can inspire each other and learn from others' strong points, filling study with joy of stimulation.

#### 4.4 Blended Learning Provide Plentiful Learning Material for Sustainable Learning

Compared to lifelong learning, time spent learning in university is short, which is a compact period for learning science basis and professional knowledge, making right learning method and cultivation of learning ability is more important than mastery of certain technique [6]. It is essential to build plentiful learning resource on a platform for students to learn by themselves.

##### 4.4.1 A Easy-going Textbook

Textbook is a carrier expressing learning content and learning method, which is also main media for teachers to teach and students to learn. When authoring the textbook we construct the knowledge in hierarchy to follow the cognition steps of a learner. Secondly, we fostering on improving students' ability of learning and applying knowledge. Thirdly, we try to keep a proportion for the four knowledge modules. It introduces basic theory but don't pursue depth, as well as emphasis on putting theory into practical method. With a case of "educational management system" throughout all its chapters, this textbook has plentiful examples to make students understand and master basic knowledge under motivation of application practice. What's more, make them gain thorough understanding of knowledge and integrate practice into system analysis, system design and system realization.

##### 4.4.2 A Website Platform

Since the course consists of several knowledge modules and the course time is limited, and also some students want further study on some points. We develop a website to provide more learning materials including lecture notes, database samples, teaching video and experiment video which provide students with ways to look for material and solve problems by themselves (as shown in Fig. 2).

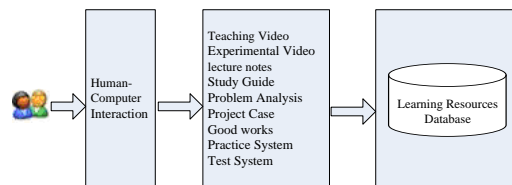


Fig 2. Self Study Platform

#### 4.5 Comprehensive Evaluating Mechanisms

Tests should reflect teaching objective comprehensively which not only assess on knowledge but especially on application ability. This course assessment includes several parts: theory test, practice test, report assessment (design document, software and oral report). The comprehensive assessment surely makes students pursue comprehensive knowledge application thus to achieve the course goal.

## **5. Practical effects of course teaching**

### *5.1 Results from the execution of course teaching*

This course is a public computer foundation course that is established gradually to meet the requirements of higher level computer technology education, which also involves cultivation of thinking style, theory, developing technology and application. It has been studied by about 10000 students in the last 10 years. Many students acknowledge that they have a view of information system and have a clue to apply it in their work.

### *5.2 Further improvement*

Since the course time is limited, we should build better environment for students to independent study or learn from each other. Students usually put great effort in the sections of database manipulation and program design, but it is crucial to be capable of analyzing and designing system, composing document and team collaboration for an information system development, which should be strengthened and revealed for students through teaching material organization, teaching method and practice.

## **6. Conclusion**

When information technology is penetrating into every field, we need compound talents with professional knowledge in one certain field and computer application ability. A person with information resource consciousness will integrate information service demand actively. Affording 90% of university students' information technology education task, computer foundation education in university must emphasize cultivation of students' ability to analyze and use information and introduce information technology to their fields fully and properly.

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