

Education on ICT in JAPAN

Brief Introduction of investigation by
ICT Education Committee of JSCE in
2002.

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Background

- Development of ICT was proceeding rapidly, the range of subjects which should be taught in educational organizations was becoming deeper and deeper, and wider and wider.

What should we teach on ICT in civil engineering or other related branches of higher educational organizations, in order for the society to be persuaded?

continued

- In the past decade, Japanese government introduced so-called IT related subjects to enhance the IT literacy into elementary, junior, and junior high schools.
- The young generation are familiar with fundamental software such as word processors, internet browsing.
- In the case of my generation, we did not learn anything about IT or computers until entering the university, and did learn algorithm theory, some artificial languages in the university for the first moment and numerical analysis.

Purpose of this investigation done by JSCE in 2002

- The change of the IT education in elementary and junior education in JAPAN.
- Necessity of establishment of IT education program in higher education.
- The committee of IT education
 - Investigated the situation of each civil engineering department of university that each member belonged,
 - Classified items to be taught on IT in higher education.
 - Identified contents which should be included in each items and levels of achievement.

What should be taught?

- Basic knowledge
History, OS , Software, Hardware, Word processor, Presentation Software, Spreadsheet software
- Exchange of information
Networking, Internet, E-mail, Website, IT-ethics
- Presentation of information
Multi-media, CG, CAD, Graph
- Management and processing of information
Database, Programming, Object-oriented programming, Mathematical processing

Levels of Achievement

- Basic level

Commonsense for general ICT users

Be able to utilize some kinds of fundamental software.

Lack of knowledge on why you can do it.

Users of “black boxes”

- Intermediate level

IT power users

Use with understanding on why you can do it.

- Advanced level

IT Manager

Deep understanding on why you can do it.

Situation of eight universities

- Most universities had dealt with
 - Basic knowledge, File processing
 - Word processor and Spread sheet
 - Algorithm and FORTRAN programming
 - Internet, website, E-mail
- A few universities had dealt with
 - Hardware knowledge
 - Network management
 - Presentation software
 - Multimedia, CG, CAD, Database
- No university had dealt with
 - GIS, Mathematic processing, Object-oriented programming, Computer management

Usage of “black boxes”

- Traditional computer-related education was on the understanding and literacy of some artificial languages such as FORTRAN, BASIC, and so forth.
- On the other hand, the usage of general-use software as “black box” was decreasing rapidly at that moment.
- So, most of members related to the investigation had a feeling that the usage of software is not so important compared with learning fundamental knowledge of artificial languages, algorithm, and so forth.

Discrete Mathematics

- Set Theory,
- Permutations and Combination,
- Graph Theory,
- Algorithm Analysis,
- Fundamental Logic,

As an interface from continuous or real world to computer-based world, to create or design software to achieve some kinds of creative outcomes.

Creativity by using software

- Usage of Software could help to find new information, to get some knowledge to do creative decision making.
- Addition of new original functions to some software to achieve something creative.

Concluding remarks

- Traditional education of FORTRAN programming for numerical analysis had been chosen as an artificial language to be taught.
- Utilization of presentation software had not spread widely in 2002.
- Usage of some kinds of software as so-called “**black-box**” was criticized, and the importance of the education of **discrete mathematics** in order for software users to understand what is going on in the computer was emphasized.

Has the Situation been improved?

Education on ICT in Musashi Institute of Technology

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Subjects taught in Civil Eng. Dept. of Musashi Inst. Tech.

- Basic classes for all engineering students

Information Literacy(R), Introduction to Computer Systems,
Introduction to C Programming

- Freshman of Civil

Auto cad exercise(R), **Word processing/Presentation(R)**

- Sophomore of Civil

Information Technology, **GIS Exercise(R)**, **Surveying(R)**, **FEM(R)**

- Junior of Civil

Spatial Information Processing, Information Systems

- Senior of Civil

Senior research project(R)

- Graduates of Civil

Applied numerical analysis, Information Systems Adv. and project

Study items in required subjects

- Basic knowledge
- File system
- Internet: WWW, E-mail, HTML, Web application
- Web page construction
- IT and ethics
- Spreadsheet, Word processor
- **Presentation tool**
- **Auto cad**
- **GIS**
- Finite Element Analysis
- Various application in Senior projects

Study items in elective subjects

- Internal presentation (Logical circuits) and Hardware
- Mechanical language
- Operating systems
- C programming
- Numerical analysis
- Computer management (Security, Web application etc.)
- ICT system development
- Spatial data processing
- Standardization, CALS/EC etc.
- Project Management software (CPM etc.)

GIS Exercise

- Analysis of Air Pollution in Tokyo with Arc GIS
- Hazard Map for earthquake with Arc GIS
- Analysis of Living environment in Tokyo with Mapinfo
- Flood prediction with GIS
- Several senior projects also have been using GIS software as an essential tool.

Toward the future change of IT Education in Civil

- Various kinds of software including GIS, CAD, PMS etc. have been utilized.
- At least in the case of MiTech., most civil students uses those software as “black box”
- Most of students do not learn any artificial language until the senior project gets start.
- We have to identify what kinds of technologies should be taught as basic, intermediate and advanced level of education.

Toward the near future

Undergraduate students (under junior)

- Learning of at least one artificial language in the undergraduate course.
- Learning of some kind of interface from the real world to the computer world.

All the graduate students and some senior students:

- Creative activity by developing some optional sub-routines by them selves, which would lead to the original outcomes.

Ability to be developed

- Fundamental IT Literacy
- Understanding of the importance of ICT not only in general usage and but also in Construction
- Fundamental software usage: GIS, CAD,...
- Ability to use ICT as powerful tools to solve problems

We have to identify what kinds of knowledge or technologies are to be required to get, in order to acquire each level of ability.