

# Multipurpose Independent-Study Environment for Information Technology Based Education and Training

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## Abstract

*We have investigated the multipurpose independent-study environment to equip all the students with a higher education of the information technology and to reduce the computer anxiety. As a trial case we considered students who are interested in the international communication through network and who want to study computer science, multimedia technology and foreign languages. The multipurpose environment, featuring a variety of computer system, opened June 2000 in Hiroshima university. Support staffs are always ready to help the students. The environment consists of four kinds of independent-study rooms, terminal rooms, VOD (Video-on-Demand) corner, and separated booths. After the environment opened, almost all computers are filled by university students. It encourages the students to obtain the practical knowledge of the information technology.*

## 1. Introduction

Owing to developments of the information technology, computers and the Internet are pretty popular now. As is called IT revolution, a lot of people use computers and access the Internet. An information system becomes one of essential tools for higher education and research works. It is also necessary for university students to live in a good campus life.

However, not all the students who enter a university have experience even to type a computer keyboard in Japan. To develop the ability to operate a computer the Government pushes forward with the plan of an educational reform in an information science from elementary schools to high schools. A computer environment will be available in almost all the schools soon, and the educational curriculum changes quickly. It is also planning to construct a virtual university which provides higher education through on-line lesson for a wide variety of persons. A university is expected to change qualitatively. In



**Figure 1** One corner of the multipurpose independent-study environment.

such circumstances a multipurpose independent-study environment for information technology based education and training was constructed in Hiroshima university at June 2000.

In the present paper we briefly review this environment and report some results of the constructed system. In Sec. 2 a current situation of the Hiroshima university is explained. We describe the form of a class in the computer literacy and discuss the computer anxiety of students. In Sec. 3 we introduce facilities of the independent-study environment. A role of the environment and support staffs is discussed. In Sec. 4 we show the situation of usage of the environment.

## 2. Current situation of students in Hiroshima University

Generally speaking, university students have different interests, opinions and motivations. Computer system in the university should, therefore, afford to help every student to achieve his/her independent purpose. A variety of

computer system is necessary for every student to acquire the appropriate skills of the information technology. But the number of staff member is restricted against a lot of purpose. It is impossible to construct a complete system to satisfy almost all the requests. Thus, it is necessary to understand the present status of the university students and to determine the order of importance for each computer system.

As is pointed out in Ref. [1] the computer anxiety level of Japanese university students is very high. We have made a survey of the computer skill and the anxiety of the first-year students in Hiroshima University for five years. We use Aikyodai's Computer Anxiety Scale (ACAS) which is proposed by K. Hirata at 1990 [2]. This scale is created to be suitable for university students in Japan. ACAS consists of 21 five-point items. (See appendix.) These items are decomposed into three subcategories, i.e., operation anxiety (OPE), computer avoidance (AVO) and technology anxiety (TEC). The possible range of scores was 7 to 35 for each subcategory. In Table 1 we show the result of ACAS for first-year students. It represents that many students have a large anxiety. This situation keeps unchanged so much for several years. It observed that only AVO slowly decreases year by year.

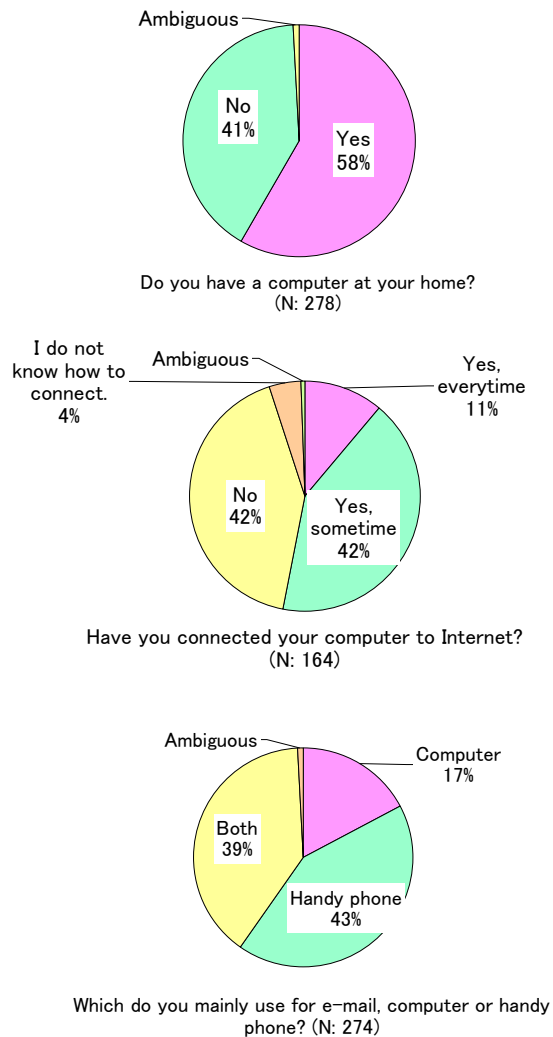
**Table 1** Results of ACAS for first-year students in Hiroshima University from 1997 to 2001. N denotes the number of observations for each year. We write the mean value of three subcategories, OPE, AVO, TEC and the total of these sub categories.

Year	N	OPE	AVO	TEC	TOTAL
1997	2027	18.1	18.5	20.3	56.9
1998	1901	17.9	18.0	20.2	56.1
1999	2001	17.8	17.9	20.3	56.0
2000	1961	18.5	17.7	20.8	57.0
2001	1162	18.2	17.2	21.0	56.4

Skills to operate a computer are not so high level for most of the first-year university students in Japan.\* The situation has been improved, but it is not very rare to find a student who has never used computer even in the faculty of science and engineering yet. In Figure 2 we illustrate a typical situation of the university students who use a terminal in the open space. It is found that many students use a handy phone to access the Internet.

Some of the fresh students have little experience to operate a computer. Classes in the computer literacy must be for beginners. The most appropriate course is com-

\* It should be noted that a handy phone is very popular with young people in Japan. Almost all the university students have a handy phone, and they operate it very well even for e-mail, see Figure 2.



**Figure 2** Situation of the Hiroshima university students were surveyed at June 2001. We received responses from about 300 users of terminal rooms. 40% of them are first year students, 30% are second year students.

posed of not only the exercise to operate a computer but also a lecture for a matter of common knowledge in the Internet society. Thus, we open a course which is constructed by two parts. The one is the basic exercise to use a computer, at least, for information search, e-mail, editing Japanese text, making web pages and presentation. The other is the lecture for a computer system and the Internet society. It is also presented examples of usage of a computer system and the Internet in research works.

Many students begin to use a computer and the Internet in a system prepared for a class in the computer literacy. The Linux, one of the Unix, operating system is installed to these computer terminals. This system is called "ICE

*Linux*". ICE means information system for communication and education. We construct the easy-to-use, stable and secure system for beginners on the Linux. We briefly review the environment for computer exercises of first year students below.

### **Exercise Rooms**

There are eight rooms with *ICE Linux* terminals and total 500 terminals are set up. Each student has the individual login account and password to use terminals. 20MB file space is given for student. All computers are networked and give them access to their own file space automatically once they are logged in. There are many useful free softwares in the world of Unix. Various applications are available on *ICE Linux*. Web browser, E-mail, telnet, news, word processor, spread sheet, dictionary, programming environments, 2D/3D graphics, visualization and mathematical tools, and so on.

After a systematic study of a computer system and the Internet society the students learn a basis to operate a computer and to access the Internet. Indeed, many students have come to use a computer system. But the exercises in the computer literacy class cannot reduce the computer anxiety of the students. It is caused by a largeness of one class size. It is very difficult to provide one-on-one support in the class. And furthermore, the most important purpose of the class is to use the computer system without any serious troubles. Unfortunately the Internet society has some risky elements for beginners. Students must learn many problems to guard themselves in the network society. Thus, some unavoidable contents in the literacy class also enhance the computer anxiety of the students.

### **3. Facilities of the multipurpose independent-study environment**

As is shown in the previous section the literacy class is not sufficient to understand a variety of activities of the information media and to reduce the computer anxiety. It is necessary to compensate the literacy class. Since the number of the teaching staff is restricted, it is very difficult to construct a systematic course of lecture and exercise as an ordinary class whose size is not so large.

One possibility to compensate the literacy class is realized by an independent-study environment [3,4]. It is considered as the most efficient approach in the present status of the Hiroshima university. As a trial case we consider students who are interested in the international communication through network and who want to study computer science, multimedia technology and foreign languages. We try to construct the independent-study

environment as possible as free from a special purpose while the assumption mentioned above. The aim of the independent-study is to equip all the students with a higher education of the information technology and to reduce the computer anxiety. For this aim we prepare the environment that is constructed by the following facilities.

#### **Open space**

We equip 130 *ICE Linux* terminals, the same system for a class in the computer literacy, on one floor. For communication through the Internet, writing a report, programming, amusement and so on students usually use their most familiar computer system here. Thus almost all the terminals in the open space are always filled by the students.

#### **Multimedia study room**

The system is arranged to make multimedia contents. We set up 21 *Macintosh* computers to use multimedia applications. Rich multimedia tools and peripherals are available, for example painting, drawing, desktop music and non-linear video editing. To make digital image and movie source we lend a digital camera and a digital video camera to the students.

#### **Intelligent study room**

There are 8 *ICE Linux* terminals which networked by the wireless LAN. A teacher can connect his computer to the plasma display and give the presentation. DVD and Video systems are also available. This room can work as a small studio to make a video of multimedia contents.

#### **Foreign language independent-study room**

Simple training is inevitable to learn foreign language in a practical level. To repeat the same thing at his/her own pace interactive multimedia materials are very useful. This room features 60 *iMac* terminals where a lot of foreign language study materials are available.

#### **VOD corner**

To access the VOD materials 45 *MS-Windows* terminals are set up. Students can watch foreign language materials which include hundreds of modern and classic movie videos and CD-ROMs. Some students use office tools on *MS-Windows* in this corner.

#### **Sound-proof booth**

For some purposes private booth is more suitable than open space. Students can use a private booth for sound-proof, watch TV and so on. Each booth features satellite TV access, a computer, a recording microphone, a headset, and video, audiocassette, and CD/MD decks.

#### **Open space laboratory**

In the open space laboratory we prepare the most up-to-date information media system to test the future coming environment. We also use the laboratory to leave the previous system for students who learn the computer literacy by that.

### Staff room

Clerical staffs, teachers and student volunteers are always ready at a staff room to help students who have any troubles or problems. The support staffs provide one-on-one help immediately. Most of students do not have enough knowledge to use a suitable system for their purpose. The role of the support staffs is very important to keep the facilities in good working order and reduce the computer anxiety.

The multipurpose independent-study environment with above facilities opened at June 2000. After that students can use these facilities from 9:00 to 20:45 on weekdays and from 10:00 to 17:00 on Saturday. It encourages the students to obtain the practical knowledge of the information technology without any stress.

### 4. Efficiency of the multipurpose independent-study environment

After the multipurpose independent-study environment opened many students use every facilities. Graduate students and teachers also use facilities to make multimedia contents and give a demonstration using multimedia materials. In the period of the school time almost all *Linux* terminals and *MS-Windows* terminals are filled with students (see Figure 1).

Using an on-line questionnaire, we surveyed an attitude to computer for users of the independent-study environment at June 2001. The questionnaire consists of 11 items about a usage of the environment and 21 items of ACAS (see Sec. 2 and appendix). No less than 300 students participated it. About 40% of them are first year students, and about 30% are second year students.

In Figure 3 we draw a part of the result about a usage. Main purposes of students are for assignments, amusements and learning computer system. The environment is used for both learning and amusements. They usually use only basic applications, for example, Web browser, e-mail and editor. These applications are introduced in the literacy class. More than 70% of users have ever asked staff member at the staff room. Indeed the staff room is always filled with not a few students who ask a question. But there is a great obstacle to challenge unknown applications for students.

Some of the students with the strong motivation to operate computer system proceed their skills step by step, and apply it for a wide variety of purposes. However, most of students can use a computer within only his/her present knowledge. No class is opened to learn about the information system in these facilities. Needless to say, it is very difficult for students to use the suitable facility for their own purpose. They must study more about the information system by themselves. Thus, we plan to make

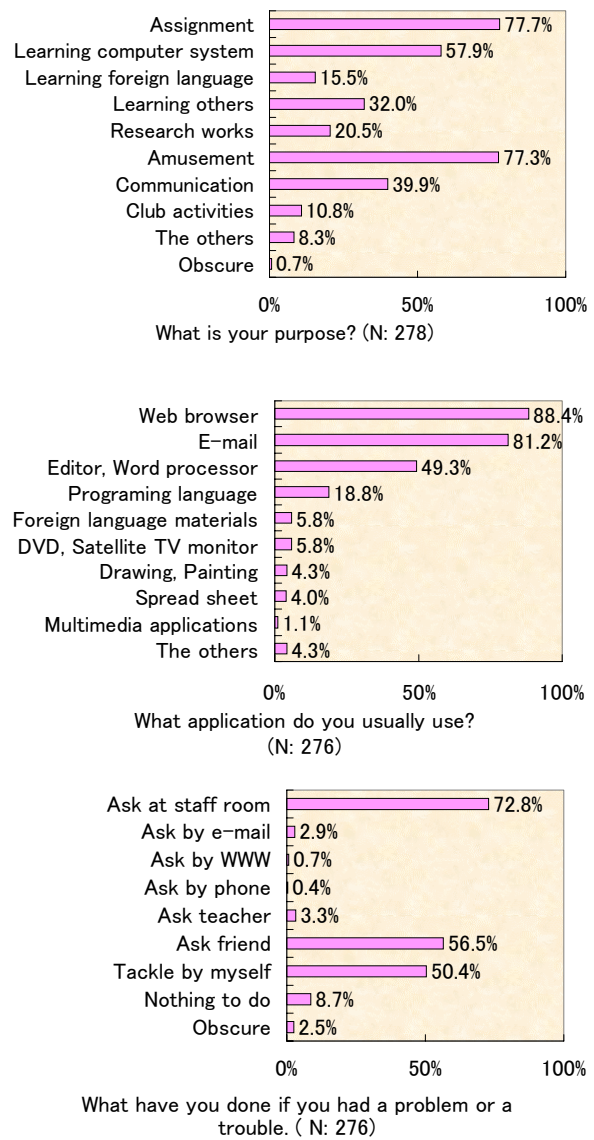


Figure 3 Usage of the multipurpose independent-study environment.

an on-line course for a systematic study about the suitable information system along their purpose. We also motivate the students to master new skills of the information technology by many interesting projects, for example, design contests of home page for Hiroshima university, recruitment of volunteer staffs, beta tester of a new environment in independent study environment and so on.

The result of ACAS for users in the independent-study environment is shown in Table 2. First year students have used the environment for only three months at the longest. Thus mean values of the first year students are higher than that of second year students. *Nextstep* terminals were

used for a class in the computer literacy when the third and fourth year students entered the university. Changing the operating system from *Nextstep* to *Linux* may enhance the computer anxiety about two point, while the sample size of third and fourth year students is not enough to say it without uncertainty.

**Table 2** Computer anxiety for users of the independent-study environment. “1<sup>st</sup>” and “2<sup>nd</sup>” represent the results for first-year and second-year undergraduate students respectively. “3<sup>rd</sup>, 4<sup>th</sup>” is the result for total of third year and fourth year students and over. “All” contains undergraduate and graduate students. Meanings of N, OPE, AVO, TEC and TOTAL are explained in Sec. 2.

Year	N	OPE	AVO	TEC	TOTAL
1 <sup>st</sup>	97	16.1	18.2	19.9	54.2
2 <sup>nd</sup>	68	15.0	16.8	19.5	51.2
3 <sup>rd</sup> , 4 <sup>th</sup>	37	15.9	17.5	20.1	53.6
All	227	15.5	17.6	19.7	52.7

For subcategories, OPE and TEC, mean values of each scale decrease compared with the results in Table 1. Especially OPE is dramatically changed. When users have some troubles to operate a computer, staff member can help them quickly. It is considered that the one-on-one support affects to decrease OPE. Some of the first year students do not use the environment on their own initiative, but at the instance of their teacher as assignment. It enhances AVO compared with the second year students. To understand such a process more precise measurement is necessary.

## 5. Conclusion

The efficiency of the independent-study environment was discussed with focusing on a computer anxiety. The students must learn huge about a computer system and Internet society to use information technology for their own purpose. In order to arrive this goal it is necessary to compensate a basic class of the computer literacy. For this purpose we introduce the independent-study environment.

The advantage of the independent-study environment is considered as:

1. A variety of computer systems can be prepared and administered by small number of staffs.
2. The student can learn at their own pace for their independent purpose.
3. It has a role to reduce a computer anxiety of students.

Using an on-line questionnaire, we found that the ACAS score of computer anxiety decreases. To say the least the independent-study environment is realized to be stress

free. It produces satisfactory results to reduce the computer anxiety.

Though all the results are based on the system in Hiroshima university, we believe that the efficiency of the independent-study environment is the same in general as in the case we have investigated.

There are some remaining problems. Our goal is to equip all the students with a higher education of the information technology. But purpose of almost all the users is restricted within a narrow range. In the present set up it is very difficult for some students to challenge unknown applications and hard to support the students who learn about an up-to-date information technology according to their own purposes. Many students hesitate to use a system which they do not learn in a literacy class.

The computer anxiety scale, ACAS, does not contain any items about the Internet and a handy phone. Now we cannot discuss the efficiency of information system without considering computer network environments. The time has come to reconsider the items in ACAS.

Now we promote to create Web based course to learn about the up-to-date information technology and to make a new computer anxiety scale which is suitable for current situation of university students in Japan. We will continue our work and we hope to reports on these problems.

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## Appendix: Items of Aikyodai’s Computer Anxiety Scale (ACAS)

A variety of computer anxiety scale has been proposed [5, 6]. In Hiroshima university we use Aikyodai’s Computer Anxiety Scale (ACAS) which is proposed by K. Hirata [2]. ACAS is similar to the scale in Ref. [6]. Items of ACAS are described in Japanese in Ref. [2]. Here we translate the items in English.

1. A computer is a convenient machine to compensate man’s weak point.
2. I will feel very nervous only by sitting down in front of a computer.
3. If I have enough money, I will buy a computer before my friend.

4. I hesitate to operate a computer where others are looking at.
5. The words "artificial intelligence" or "judgment by the computer" make me uncomfortable.
6. The keyboard of a computer disgusts me.
7. A computer seems to be honest and be truthful rather than human being.
8. When I am using a computer, I am afraid that I may break the computer by making mistake.
9. If I see those who are operating the computer well, I think that I want to be like them soon.
10. Since a computer is a logical machine, anyone will be able to operate it according to the correct manner.
11. I think that our lives will be controlled by computers soon.
12. I feel familiarity to a person who cannot operate a computer well.
13. I think that tradition will be valued more than a new thing.
14. If we will become dependent on a computer too much, I feel that something will go wrong in the future.
15. It is disgraceful to know nothing about a computer in future society.
16. I will be dismayed only by hearing a computer.
17. I do not mind even if it is thought that I know nothing about a computer.
18. I am afraid that the world changes quickly by the development of technology.
19. It is better to leave the use of a computer to the skillful man.
20. I want to know more about a computer.
21. It scares me to think that I may be transferred to an office to operate a computer after employing.

[5] See for example, Collection of Data in Center for Positive Practices, Available:

<http://www.positivepractices.com/DataCollection/TechnologyRelatedIns.html>

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