

## **Implementation of Engineering Education using Multi-media Classroom - Case of Gifu National College of Technology -**

Taichi KAMEYAMA, Kihachiro TAKETOMI, Masayuki OKUGAWA, Toshinori DEGUCHI, Ryouichi SHIBATA, Toshio USUI, Takao SUZUKI and Masamitsu KOSAKI<sup>1</sup>

*Gifu National College of Technology<sup>1</sup>*

[kame@gifu-nct.ac.jp](mailto:kame@gifu-nct.ac.jp), [taketomi@gifu-nct.ac.jp](mailto:taketomi@gifu-nct.ac.jp), [okugawa@gifu-nct.ac.jp](mailto:okugawa@gifu-nct.ac.jp), [deguchi@gifu-nct.ac.jp](mailto:deguchi@gifu-nct.ac.jp),  
[ryos@gifu-nct.ac.jp](mailto:ryos@gifu-nct.ac.jp), [usui@gifu-nct.ac.jp](mailto:usui@gifu-nct.ac.jp), [suzutaka@gifu-nct.ac.jp](mailto:suzutaka@gifu-nct.ac.jp), [kosaki@gifu-nct.ac.jp](mailto:kosaki@gifu-nct.ac.jp)

### **Abstract**

*Gifu National College of Technology had built a new facility building in 2000. This building has six new classrooms that have multi-media equipments for use in all of the classes held in this new hi-tech building. Five of the classrooms are usually used as the fourth-year students' homerooms, that are different from the other ordinary ones. Each of the rooms has an OHC (Over Head Camera) and a projector for teacher's use, as well as more than forty PCs for the individual students. Teachers can project the image of their teaching materials on the screen at the front of the room, and/or distribute them on the students' PC screens. Teachers can apply any materials that are to be delivered electronically, such as WEB contents, text files and so on. In this situation of possibly individual education, students can make progress at their own pace, which may lead them to successful learning.*

*The important point is that these rooms are not considered "special". Students come straight to the room in the morning, eat lunch right here, and spend after school in the very same place. It means that the students are always exposed to the electronic interface through their days. It must be interesting how this situation could change the thoughts and behavior of the students.*

*In this paper, the present situation of the multi-media classrooms, and the voice of the students are reported.*

### **1. Introduction**

Gifu National College of Technology was established in 1963. This school, as well as the other "Colleges of Technology", accepts young students from junior high schools and offers them specialized technical education for five years. Our educational objectives are 1: to educate

students to be competent members of society with a broad view of things, 2: to train students to be proficient engineers with great creative, applicable and practical abilities, 3: to contribute to the society through its education and research.

Since several years ago, we had been proposing a new style of education involving using digital-media, which differs radically from the traditional ways. It was finally accepted by the ministry in 1999 and was funded to build a new facility in which the multi-media classes would be held.

This report provides, 1: what the multi-media education building is like, including what are equipped with in the facility, 2: how the classes are taking place in there, 3: what the students are thinking while studying in this new-concept school building.

### **2. Multi-media Classrooms**

#### **2.1. Characteristics of Education in Gifu National College of Technology**

In our school, each classroom consists of the students according to their major and the entrance year(grade). Most of the education activities held in the school are based on these classrooms. In the course of general education, students comprehensively learn humanities, natural sciences, and other fundamental subjects indispensable to engineering education. In the specialized course, especially in the fourth and fifth grade, students have to take more number of specific subjects according to their majors. At this stage, students are supposed to complete their skills and knowledge of engineering that they have accumulated through their academic activities. That is why we regard the fourth grade as the most important and characteristic stage of our school's

curriculum. And it made us consider what the classroom for the fourth grade students should be, which led us make the plan to build this new facility building.

## 2.1. Characteristics of multi-media classroom

Like most of the other schools, the traditional way of lectures has been taken place in our school. "Traditional way" means such the class in which one teacher teach in front of the students using chalk to write on the blackboard. Of course some classes such as experiments, practical training and seminars are taken in other ways though.

In recent years, however, computers and the relevant devices have become more applicable to education because of the promotion of their performance and the reduction in their price. In addition, the development of communication technology made computers suit education in schools.

We also have been using computers in some lectures, not only for teaching information technology or computers itself, but also for teaching various subjects like math, physics, foreign languages, etc., in the special facility so called the Information Center.

In this situation, we decided to furnish the fourth grade students' classrooms with multi-media devices so that more effective and innovative lectures can be realized. By providing multi-media PCs for every students at each desk, instructive materials can be shown on each student's LCD display, not on the blackboard in front of the room. Teachers can use any form of teaching materials as long as those materials can somehow be digitized, such as simple text, html, photos, videos and/or any form of the application data run on the computer (e.g. Microsoft PowerPoint). As the computers are connected to the Internet through the school's LAN, the worldwide resource on the Internet can be employed in lectures as well as each teacher's handmade materials stored in their



**Picture 1 Multi-media classroom**

own computers set in the offices.

In addition to PCs, there is an LCD projector to show images on the large screen in front of the room. As any kind of image source can be fed into this projector, teachers can choose the PC and the projector according to the situation. (Both can be used at the same time.) Blackboards (whiteboards) are also set in each classroom in case teachers want to use. One of the rooms are photographed in Picture 1. The details of the rooms and the building are published in the proceedings of the ITHET2001, titled "Introduction of Multimedia Engineering Education".

## 3. Lectures in multi-media classrooms

In our school, the lectures held in the fourth grade classrooms have switched from the traditional style in which "textbooks and blackboards" are used mainly, to those in which the individual display devices are used. Although we have only several-month-long experience, we have found that a small variety of the lecture methods are available here as follows.

- 1. Using digital materials stored in the server**  
Accessible through LAN, available in any time.
- 2. Sending screenshots of the teacher's computer to all the students' displays at once**  
Suits for using presentation software (e.g. Microsoft PowerPoint), easy to keep timeline of the lecture.
- 3. Sending the real-time images on the whiteboard to all the students' displays**  
Utilizing a whiteboard marker digitizer, hand-written explanations turns into digital material.
- 4. Sending the images from OHC or video**  
With an OHC and video, any non-digital materials, such as something on paper or concrete materials, can be shown.

In these methods available in the new classroom, teachers have one or more choice to decide which way they take depending the characteristics of the subject. The teachers in charge of the fourth grade classes are still trying to find the best way to make full use of the new classrooms. They have, however, much broader selection compared to what were available in the traditional classrooms.

## 4. Evaluation for multi-media classrooms by students

Two and a half months after the beginning of the lectures in these classrooms, a questionnaire survey was performed to know what the students were thinking about the lectures in these classrooms. All the students in the fourth grade were involved in this survey, and 194

students submitted valid answers. The analysis are shown as follows.

#### 4.1. Comparison to the traditional style of lectures

Students have been given the traditional style of lectures in which “blackboards and textbooks” are mainly used since they started learning at school.

First of all, students were asked what they are thinking about the new style of lectures in the new classrooms. As Figure 1 shows, half of the students find no change about the progress speed of the lectures, whereas 37% of them feel it increasing. Figure 2 shows that almost half of the students think there is no change in terms of intelligibility, while the rest of them are divided almost equally into both

sides. The change in the amount of contents of the lectures that the students must learn is shown in Figure 3. Where 76% of the students think there is no difference, slightly more of them think it increased than those who think it decreased. According to the results shown above, it may be the reason why intelligibility of the lectures has not changed so much that the progress speed and the amount of contents have increased.

Figure 4 shows how easy the students feel to ask teachers questions. More than half of them feel no difference, but those who feel uneasiness exceed the opposite.

#### 4.2. Comparison of intelligibility according to subjects

In the fourth grade of our school, students have 36 hours

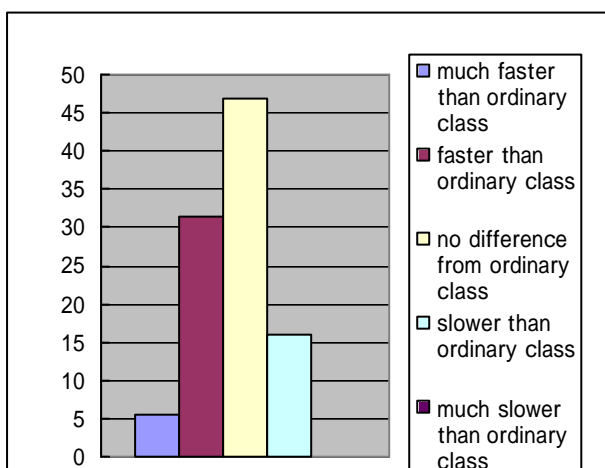


Figure 1. What do you think about the progress speed in this classroom?

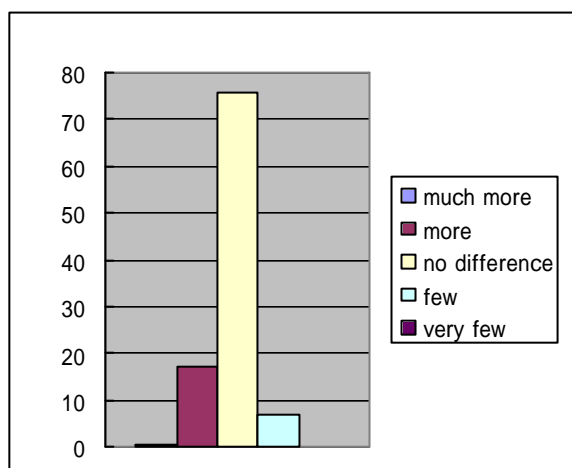


Figure 3. Do you think the contents of the lectures increased?

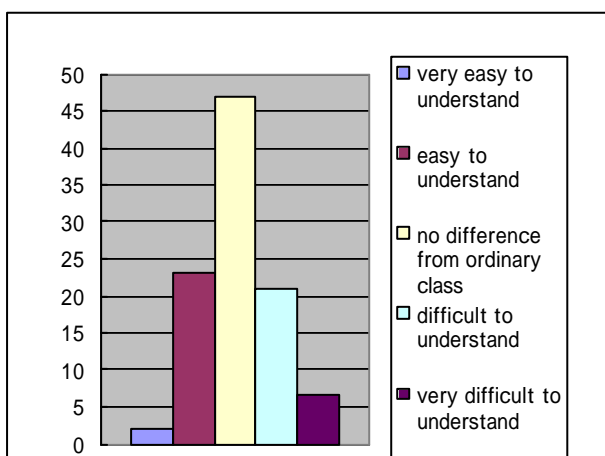


Figure 2. What do you think about the lectures using the devices in class?

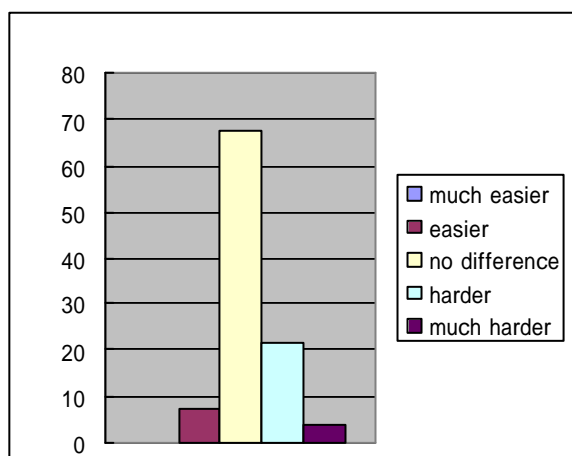


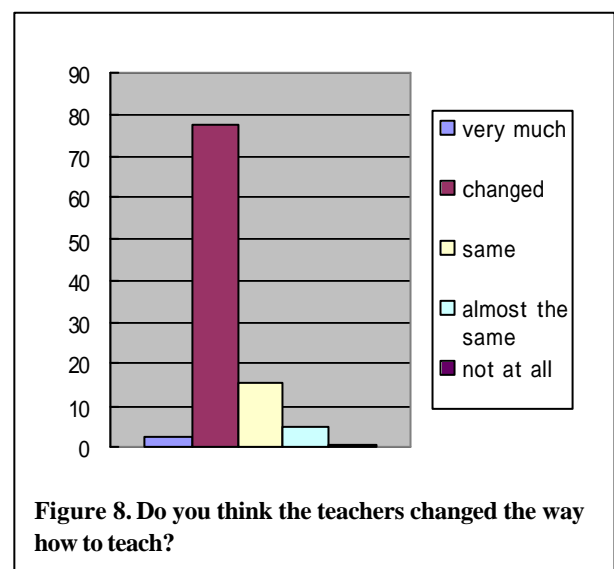
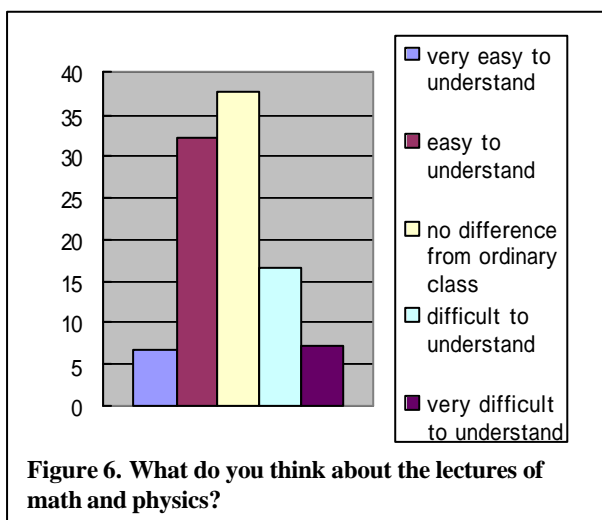
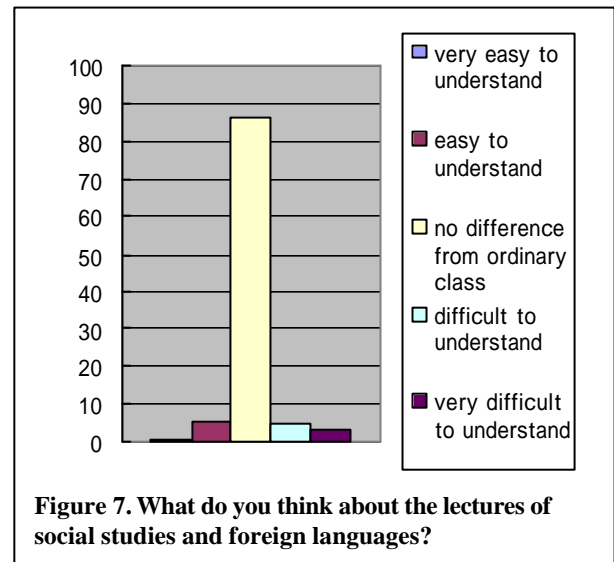
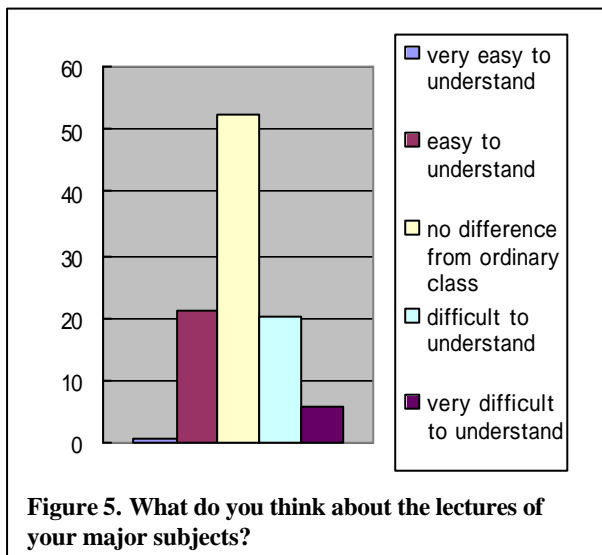
Figure 4. Do you think it's easy to ask teachers questions in this room?

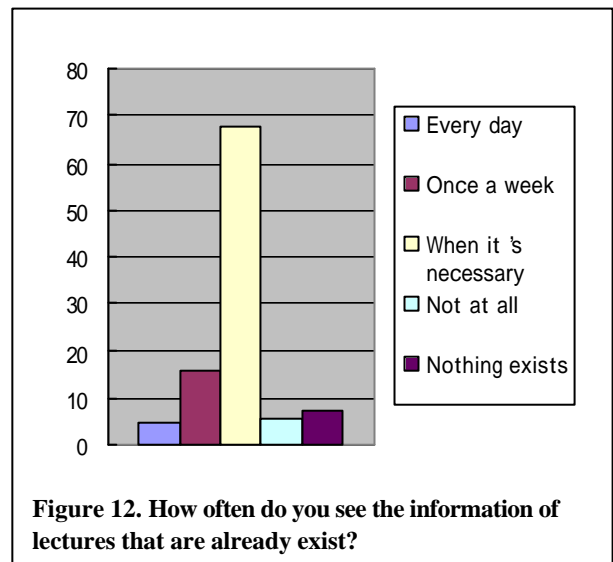
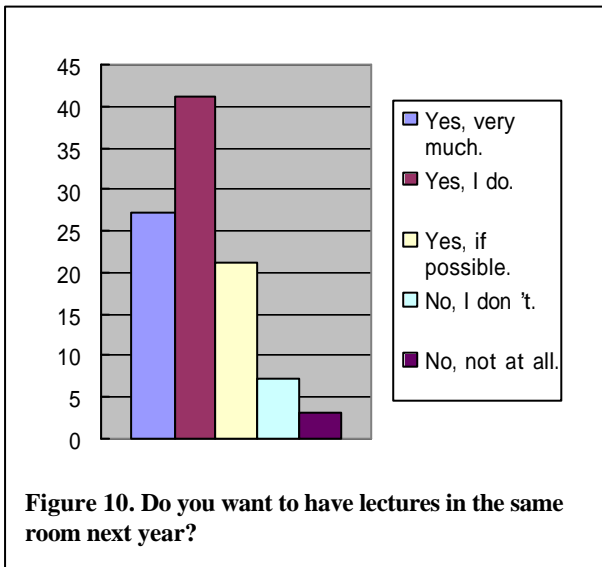
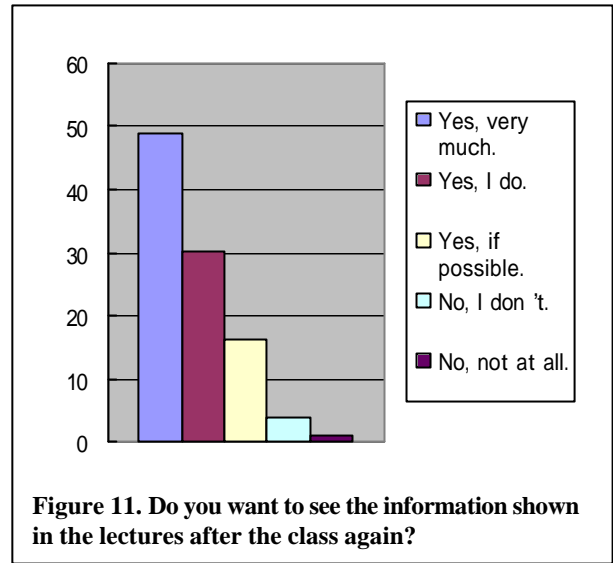
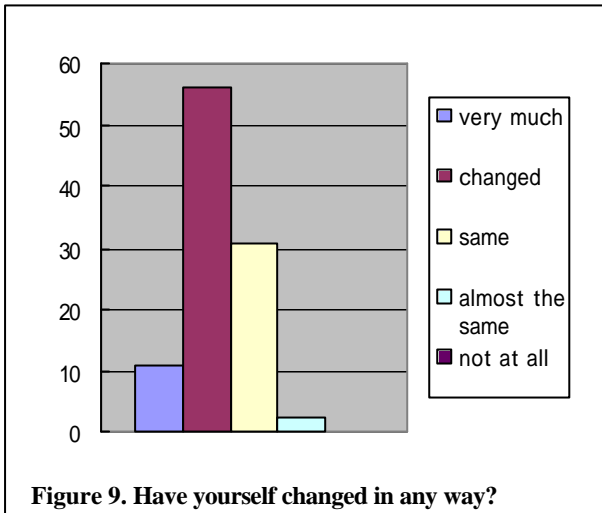
of subjects in a week. Among them, 29 lectures including 9 hours of the general subjects and 5 hours of the fundamental science subjects, are held in the multi-media classrooms. Figure 5, 6 and 7 show what subjects do the students think are more intelligible. According to them, the fundamental science subjects (applied mathematics and applied physics) are obviously appreciated by the students to be more intelligible than the other subjects. It is reported that the teachers of math and physics continuously use a presentation software with which “visual” explanation can be put into practice, which enables the students to understand even more complicated equations along with aid of visible figures. Additional questionnaires for teachers are planned in order to find what they are thinking about the lectures in

the multi-media classrooms.

### 4.3. Attitudes of teachers and students in the new classroom

According to Figure 8, approximately 80% of the students think the teachers’ attitudes have changed. This result might mean that the teachers had to change how to teach because of the implementation of multi-media equipments. On the other hand, as shown in Figure 9, it was found that many of the students have also changed their attitudes in the class. And furthermore, Figure 10 tells one third of the students answered favorably to the question asking if they want to have lectures in the same classroom.





## 5. Discussion on the lectures in multi-media classroom

As the new multi-media classrooms were built for “homeroms” for the fourth graders, the students are always exposed to the digital interface which exist in the rooms. If this situation is arranged appropriately, it may lead the students to positive motivation to learn. One of the evidence can be obtained from Figure 11 and 12. Most of the students answered affirmatively to the question asking if they wanted to see the materials after the lectures, and almost the same number of the students actually consulted those materials stored in the data server which were once used in the previous lectures. There is only a

small volume of materials are stored in the server right now, though, a growing number of materials are supposed to be registered, which will enable to elevate the students’ academic attainment.

Although it is not well established yet, we believe this new education system must be more beneficial for the students, because this new system will obviously promote the students’ motivation and understanding along with its highly sophisticated display potential. This can be endorsed by seeing Figure 10 again which tells that the students like to have lectures in the same room hereafter. Teachers, on the other hand, will be required to shift their mind for the multi-media oriented education. As shown in Figure 8 and 9, the students think some teachers changed the way how they teach, so did the students change their

attitudes in the classes. The continuous assessment of the education in these classrooms is going to be necessary.

## **6. Conclusion**

At present, Gifu National College of Technology is the only one that have such an educational system amongst the 62 “Colleges of Technology” in Japan. In the ordinary colleges or universities in Japan, students have to move to the classroom where each lecture takes place because they have no concept of “homeroom”, whereas our school brought the information devices into the students’ “living place”, and established an environment in which the students can use those devices through their everyday school life. Since there is no equivalent case in any other schools right now, we must continue research on education of ours in order to make it more effective.