The Practice of Study on Heredity by Use of Teaching Materials for Web Based Training in a Correspondence High School

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Abstract

Currently, about 180,000 students are attending Japanese correspondence high schools. There are many kinds of students having considerable differences of scholastic ability. The fact leads to the necessity of introducing individual study system to ensure the achievement of learning of students in correspondence high schools. The Web Based Training System was developed for that purpose based on a popular Learning Management System"Moodle". The development was promoted by a recent reform of government policy that recognized utilization of e-Learning in correspondence high schools.

The system processes the study courses described by XML with XSLT processor and JavaScript. The greatest feature of the system is ability to save study-records of students in a server and then analyze them. This system has been used in biology classes to study heredity. It is found that some students showed enhancement of their learning will and corrections of wrong concepts concerning to heredity due to the usage of results of study-records and its analysis. As the result, it was confirmed that the use of analysis of study-records in e-Learning was effective to support the individual education in a corresponding high school.

Keywords

e-Learning, web based training, correspondence high school, science education

Introduction

The high school students who attend at correspondence high schools in Japan descend over 180,000 people in 2006, and it is accounting for about 5% of the students who are on the register in high schools.

The causes are accept various students who can't go on to the full-time high schools, for example youth workers, truancies etc. The curriculum of a correspondence high school has been permitted to be done by correction and interview guidance in the exception of the high school course of study. To guide such as diversified students, we should make works according to the study progress and take individual interview guidance.

However, a lot of schools can't increase in the number of teachers, and are good at individual method and techniques of education with the lack of the research on the individual study, because of an increase in the number of students.

Then, our research consortium developed the teaching practice by e-Learning based on ICT (Information Communication Technology) that rapidly maintained many schools as the method of solving such problems, and examined the remote learning and individual study. Teachers need the LMS (Learning Management System) that manages the registration of the management of student's individual information and the study course to teach something by using the WBT (Web Based Training) system. The development of these kinds of system, we need much budget, but now open source LMS system "Moodle" is developed, offered (William, 2006), and if the execution system of the study courses that operate on LMS, the problem of the budget will be solved as soon.

We developed the execution support system of the WBT that works on Moodle and we practiced it in the study of heredity that is a part of the subject "BiologyⅠ" in a correspondence high school. We reported that we had obtained the result in which it was effective of not only the remote learning but also the support of the individual study to various students.

1   Use of computer in study of heredity

1.1   The Reason for selected this area

Up to now, there are a lot of reports about the practice and the effectiveness of the WBT system in the biological education (McLaughlin 2001, Tassos 2003, Ogren 2004).and such researches that use e-Learning based on the WBT will increase in the future. We reported the practice the study of heredity in "BiologyⅠ" by e-Learning and the reasons for selected this area are following.

First, there are many students who moved other schools in correspondence high schools and some of them have already studied the heredity, but other of them have never studied, so when they start to study there is difference of scholastic attainments between them.

Secondarily, in the study of heredity, students should solve various problems and exist by using the logical idea and the law, therefore, some of them want to learn progressive contents, but other of them can't understand the basic theory, so the difference of the interest, concern and motivation is between students. For these reasons, in the study of this field, we can verify the effectiveness of the individual support with e-learning to the students who have different study attainment level or difficult to learn by themselves.

Thirdly, there are few teaching materials that the result comes out short time and take easy to handle, so in

these kinds of study, the simulation and mock experiments by using the computer are effective.

1.2   The new WBT system that works on   LMS

The study courseware execution and support system that we developed for the WBT works on Moodle that is the one of most popular LMS in the world and if somebody would like to study by this system, teachers only up-load the study courses   that described with XML.

This system is composed of three kinds of software. The main software, it decodes the course file described with XML, and presented on the screen by a browser. Figure 1 showed the screen of Moodle and the study course written with XML. The other kinds of software are the XML editor and the analyzer that analyzes the study records.

The basis of the description of XML is to describe the one screen between the frame tag (<frame> ～ </frame>).

In the frame tag, there are a lot of tag to draw in the figures, to present the character string and the images. (Figure 2).

Frame, it is defined as the content of one screen presented on the display, and the study course is composed what kinds of frame are presented in what order. The order of the presented frame and the message can be changed by the answer that the students input.

Figure 1 Screen of Moodle (top), Screen in study course (bottom)

When click the study course title in Moodle, the course starts.

This description is very difficult to understand for common users, therefore we developed the special XML editor.

The study result of students is recorded in the server and teachers confirm by the analyzer.

The decoder, editor, analyzer, these are free software. (written in appendices)

```
<frame title="question 1" type="X">
<present back ground color="#FFFFC8" back
ground color2="#5173E1" >
<label back ground=" figure on" edit="on">
<string>
  まず，メンデルはある仮説をたてました.
</string>
    (Omission)
<image>
  <image file>beans.jpg</ image file >
  < display function reverse ="off" />
  <coordinate        left="420"    top="225"
width="276" height="226" />
```

```
    </image>
<label background="off" edit="on">
   <string>エンドウの花と種子</string>
   <format character class ="horizon" character
arrangement="left"    interlinear    space="110"
margin side ="18" margin length="20" />
   <coordinate left="222" top="460"
width="349" height ="31" />
   <font name ="MS Gothic" size="30" color
="#000000"      shadow      ="off"      shadow
color="#000000" />
   </label>
   </present>
   <input title="次へ" />
 </frame>
```

Figure 2 Contents of description in XML

Figure 3 is the principle to which the course that had been described with XML was displayed. The XML file is converted into HTML by the XSLT processor and JavaScript. So the students can only execute the study courses by a browser.
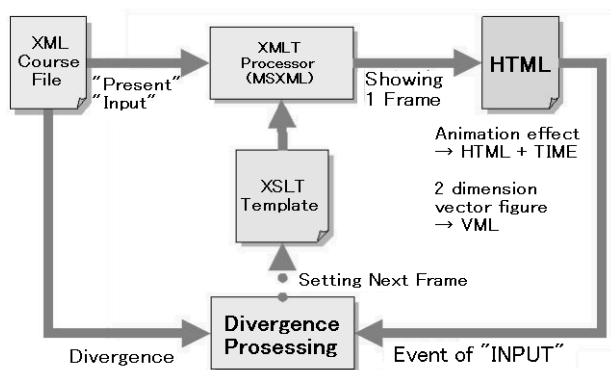

Figure 3 Principle of operation of XML course files

2   Result

2.1   The students study records

I made the study course to study the base of the heredity with this system, and I tried it for 26 students who hoped to study at home in the Internet. The one purpose of this practice is verifying whether they became the independent learners by using e-Learning. Therefore we built in this system to graph students study records and check them a browser. Figure 4 is a part of study records (12 students who participated in this study), making to the thumbnails. The entire student's study situation can be understood by making it to the thumbnails. And when each graph is clicked, we can understand the details of the students study records.
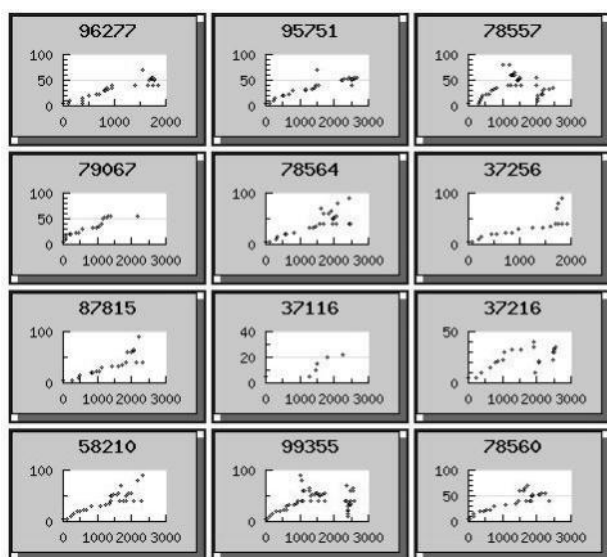

Figure 4 Graph of the study records that made to the thumbnails

The number of each graph title is the student ID and the spindle axis indicates the ratio of the study progress and the horizontal axis does the studying time.

The study course manufacturers can understand which students study good or bad from the shape of the graph. The most important point is not to confirm whether the student really understood from the analysis result, but it is the feedback of them to the students and they had missing concept or not. In this case, the e-mail communication was very profitable.

This research is the practice by e-Learning based on the WBT teaching materials as described at the introduction. The big difference between conventional CAI and e-Learning is whether there is the interactive situation between the students and the teachers or not. This practice that only uses the WBT doesn't have the correct interactive situation, because teachers and students state asynchronous. However, the interactive situation was secured by the teacher's analyzing the study records and feeding back the result to the students with e-mail.

2.2   The evaluation of this system by students

  After the students studied the course, they answered the questionnaire on online. Figure 5 is the result.

   There were a lot of affirmative answers excluding operation. As the reason, some students are inexperienced to the operation of computer. There were no negative answers about the images.

  And there were a lot of opinions that they were interested in advanced images and animations, movies are easy for them to understand better than figures in the textbook. Moreover, they had a lot of opinions that this system was profitable to study anywhere and anytime by their own pace.
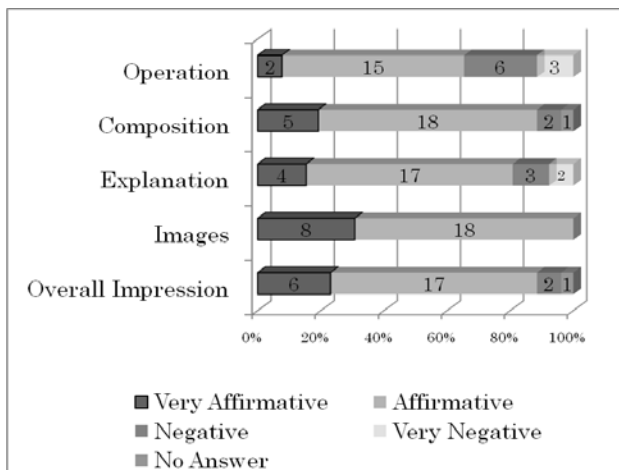

Figure 5 Result of the questionnaire concerning the study course

3   Conclusion

   We purposed to verify whether this system was able to support independent learners who were in a correspondence high school by e-Learning. It was verified to be able to secure interactive situation to use the synchronous type system that was supported by the study records analysis, the questionnaire, and the e-mail. Especially, it was verified that study by individual support was effective such as the area that the study progress of students was different. And it was clarified to use multi-media leaning materials of the images and animations, etc. as the substitution of the experiment.

  In this practice, some students had missing concepts and I found them in communications by the feedback of the study result. The recent high school textbooks are written about the content beyond the limits of the course of study, and it is difficult for independent learners to understand, so the wrong science concept is generated easily. Therefore, it is not judged that individual study of the

students has been approved only by analyzing the study records and it is necessary to support by the interview guidance or e-mail communication.

  It is difficult for the public high schools to construct the learning environment that was supported e-Learning system that has been used in universities and companies, because it need much budget.

  The system that was developed is open source, so the problem of the budget will solve by using such as this system and contribute the development of e-Learning in correspondence high schools, in the   future. It was clarified that the support of individual study and independent learning were effective for the students who can't go to school every day by the analysis study records and understanding the study situation.

  However, how do we analyze the study records and develop the effective teaching method or techniques of instruction? We should continue research and have to construct the environment that many teachers can develop the study courses and they share them at each school. Then, we are planning to prepare, and to put the server that everybody can use by up-loading the study courses free of charge in the support of the company.

4   Appendices and references

4.1   Appendices

  This paper is summarized a part of the doctor thesis "The Development of Study Method of Using e-Learning in a Correspondence High School

  – Improvement of Approach on Science Education by Strengthening Individual Support – " (Hiromitsu KOBAYASHI, 2008, Tokyo Gakugei Univ.)

  The system in this paper can be downloaded from the following sites but it is only a Japanese version and we consider making to several languages.

  http://www.e-lclub.com

4.2   References

McLaughlin，J．S．(2001).Breaking Out of the Box，*The American Biology Teacher*, 63,2，110-115

Ogren，P．J．D et al.(2004).Web Vamera Use in Development Biology，Molecular Biology & Biochemistry Laboratories, *The American Biology Teacher,* 66, 1, 57-63

Tassos A. Mikropoulos (2003).Virtual environment in biology teaching，*Journal of biological education*，37, 4, 176-181

William Rice (2006). Moodle E-learning Course Development, *Packed Publishing*，

Yuuki Kato, Kanj Akaori(2005).Analysis Of judgement Of Partners' Emotion During E-mail And Face-Face Communication，*J. Sci. Educ. Japan*，29, 5