ABSTRACT
Information literacy study subjects should promote the student’s ability to handle real world problems by using information technology in early childhood education courses. To realize the above target, this paper proposes an information literacy education course adopting 3DML teaching material creation for kindergartens and nursery schools. 3DML is a programming language developed by Flatland Online Inc. that creates three-dimensional pictures on the Web. The proposed course teaches students how to use information technology in the childcare field by creating 3DML contents for a virtual zoo and a virtual aquarium.

KEY WORDS
Computer Literacy, Early Childhood Education, Multimedia, 3DML

1. Introduction
Information literacy subjects should promote the ability to handle real world problems by using Information Technology (IT) in early childhood collegiate education courses. To realize this target, this paper proposes a new subject of study that combines three academic domains: information technology, nurture science, and arts and crafts for early childhood education.

The students create three-dimensional teaching materials by using 3DML, a simple markup language developed by Flatland Online that creates navigable and customizable 3D media environments on the Web. By creating teaching materials, the students actively learn information literacy skills for early childhood development as well as the possibility of information technology in nurturing activities from the teacher’s viewpoint. Finally, the students can utilize IT knowledge in the real world.

Student1 create original 3DML materials by themselves in the course. They learn the power of moving images and sounds, especially the impact on the children’s comprehension. Also, the students learn how to handle graphical images and sound data on a personal computer (PC). They study how to use a presentation tool, a paint tool, a scanner, a digital camera, a printer, an operational system, and a personal computer. They also become familiar with copyright law and issues of privacy in the course because such legal viewpoints are important when creating digital multimedia materials in the real world.

By using three-dimensional images, the student creates teaching materials that expose the children to scenes that cannot be experienced in the classroom: a virtual zoo and aquarium. In the course, students themselves play the created 3DML material in a kindergarten. The children dive at the screen to catch the reflections of animals and fish in a large screen of a liquid crystal projector; they cheered after listening to the sounds of animals. Some children “strolled” around the aquarium and the zoo by using a laptop computer mouse.

This paper outlines the “virtual zoo” and “virtual aquarium” courses at Tokiwakai College. The presentation practice of the students of the Tokiwakai Kindergarten is reported. An actual world experiment clarified the effectiveness of the proposed approach for a college information literacy education course.

2. Teaching Materials For Early Childhood Education Using 3DML

2.1 Virtual Zoo and Aquarium Outlines
The virtual zoo and aquarium were imagined on the Web using 3-dimensional pictures. The latter was designed by a Tokiwakai college student. Walking through the inside of the zoo or the aquarium can be easily achieved using a Web browser. Displays of animals and fish, and

1 All students are female in Tokiwakai College.

2 Micro Soft and, Power Point
3 Adobe and, Photoshop
4 Microsoft Windows
reproductions of bird cries are possible. Children can operate it by themselves and walk through jungles, prairies, or underwater. Moreover, it can be used as a teaching material. Figure 1 shows the display images of the 3DML zoo and aquarium.

In the course a Three-Dimensional Markup Language (3DML), an image description language developed by U.S. Flatland Online, was employed to create the virtual zoo and aquarium. 3DML is a programming language similar to HTML. Implementation in 3-dimensional space is easy by using such general-purpose Windows software as “Memo Pad” and “Paint Tool.” In 3DML, three-dimensional spaces are constructed from cubes called Blocks (Figure 2) whose surface is covered by a photograph (GIF format file) taken with a digital camera.

The virtual zoo is experienced as a “Safari Park” in which the audience (children) can walk. A jungle and a waterside provide the opportunity for the children to look for animals. They can hear a cry when an animal is near. A picture with GIF animation is employed to create animals that lurk in animated thickets.

Fish and marine life can be observed in the virtual aquarium. Moreover, the children can enjoy both the sea surface and inside the sea, so that they can learn and experience the difference between land and marine living things. A virtual fence in the sea offers various viewpoints that can be moved vertically and horizontally to approach fish.

2.2 3DML Merits

As digital teaching materials for children, the following points are important for the proposed course. 1) PCs and projectors are rather expensive to use in kindergartens. 2) The support and maintenance of PC tools for kindergartens is not organized. 3) Children have many other materials with which to play, from picture books to DVD players.

However, a major merit of the 3DML material is that students can create three-dimensional space and maneuver in it. 3DML never requires special tools; all of its tools are popular and cheap, meaning that the necessary skills are effective for the children’s daily lives. 3-dimensional pictures can also be built easily. Considering their use in kindergartens, the creation of virtual zoos and aquariums has the following advantages:

1) A student can create and manage original teaching materials for his/her class.
2) Contents can be created in conjunction with a university computer skills course.
3) Creating the contents and its practical use are easy, and software tools are free or cheap.
4) Children’s activity and sensitivity are stimulated.
5) Teacher can employ various methods of expression: digital cameras, hand scanning, drawing pictures, and scanning such real objects as leaves, fish, books, etc.

2.3 Examples of 3DML Works
As a 3DML work, first the authors made a virtual zoo. Based on the virtual zoo, a student made a virtual aquarium in two months using seminar and independent study time. The virtual zoo was first shown as a sample to the students. The expression features of 3DML were understood by viewing the virtual zoo.

Moreover, new content ideas were imagined and written down upon which 3DML was based. By first creating a hand drawn figure, its completed state was imagined more concretely. Moreover, it became easier to grasp the required pictures and sounds. The students finished the aquarium after understanding the structure of the program, the treatment of pictures, etc. In the beginning, they were bewildered by such computer functions as file operations.

The students’ information technology skills were about the same as beginners who can manage little more than a word processor and MS Word. However, they quickly made complicated contents because of the fun and ease of creation with 3DML; their ideas were materialized by animation and advanced 3D expressions.

3. Experiment At A Kindergarten

The students had presentation practice at Tokiwakai Kindergarten in Osaka, Japan. They projected the virtual zoo and aquarium on a screen and observed the reactions of the children. In addition, we prepared a laptop computer as teaching materials that the children could touch. Figure 3 shows the laptop computer experiment.

3.1 Children’s Reactions

The college students played the role of teachers and interacted with the children, whose reactions differed from child to child. But we were able to observe the states enjoyed by the children, for example, touching a fish reflected on the screen and making shadows in the light of the projector. Besides, we observed that the children were teaching each other with such comments as: “that cheetah ran fast,” and “a fish ate some plankton.”

Children attracted to the computer controlled its mouse well and used it to play after being taught by other students who were basically functioning as teachers. After watching and understanding how a classmate moved an animal on screen, the child could explain to another friend how to move and play with the mouse.

The group who gathered around the laptop computer enjoyed its operation. The children who wanted to play next quietly waited for their turn. We were impressed by that scene (Shown in Figure 4).

3.2 Internship in a kindergarten

At first in activities with the children, the students acting as teachers were perplexed because they did not
understand how the children could use the virtual zoo and aquarium. But they quickly acquired experience after answering questions from the children: “What is the name of this fish?” “Where is the elephant?” They discovered that it was possible to utilize the teaching materials. They began to talk a lot with the children, using the contents to ask such questions and make such comments as “where is the giraffe?” and “do you know the name of this creature on the land?” and “let's go over there.” (Figure 5)

In particular, the student who created the virtual aquarium interacted positively with the children. She eagerly talked with them and explained the fish at which they were looking; they counted them together.

4. Discussion

4.1 Early Childhood Education Viewpoint

In classes using the virtual zoos and aquariums, we observed some sensitive and interesting comments from children. Teachers and children were talking actively. One remarkable result is that the students who created the teaching materials communicated positively with children, perhaps because they themselves had created the original contents. The students explained to the children about the process, concept, and enjoyment of the virtual aquarium. The children seemed to sense friendship and
significance in the teaching materials because of the way the student was talking about it. Students did their best to make the class happy because they were using self-made materials.

These results suggest that a teacher’s enthusiasm for the materials raised the expectations of the class. We saw the reactions of the children using 3DML; some were surprised by it, and some were pleased by it, largely effecting the nurturing activity.

4.2 Information Literacy Education Viewpoint

The information literacy education class effectively raised the understanding and motivation levels of the information technology of the students because of the teaching materials used in classes.

We helped students recognize the importance and necessity of computer skills for completing the contents by processing files and inputting texts. For example, necessary operations can be clearly understood; the purpose of a work renames an image file downloaded from the Web, and a work makes a Wav file of an animal’s song. In such processes, the selection of contents was carried out from copyright and educational standpoints, which also deepened the students’ understanding of information ethics.

5. Conclusion

This paper proposed a 3DML multimedia content creation and practice approach for a college childhood education course. From actual implementation in a kindergarten, the following effects were observed in the 3DML contents, the virtual zoo, and the virtual aquarium.

1) The combination of IT and practice at an actual kindergarten raises the motivation of each student in the college course.
2) The use of digital contents resulted in high communication activities between children and the students.
3) Children took interest in nature, such as jungles, and cultivated their individual self-expression by using 3D digital contents.
4) The students created various expressions by combining handmade or handwritten contents with the photos of natural objects.

In the proposed course, the students experienced a “problems finding” process in the real world. They studied how IT can be applied to solve real world problems. This curriculum was modeled on Problem based Learning (PBL), which is generally used in nursing fields. In the future, an evaluating method is required that examines the degree of mastering by the student. The reported practice was appropriate as a method for confirming the curriculum effectiveness.

References:

