An Ontological Approach for Supporting the Instructional Design Process of Information Education

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Abstract. When a teacher designs an instruction plan for information education, it is necessary to include not only the target goal of the unit but also other related goals determined by types of teaching tools and teaching materials. The purpose of this study is to support the teacher of information education in the process of designing the instruction plan. First, we propose a process for instructional design which is adapted to information education. Next, we present concepts, which comprise designed instruction and information education based on ontology theory. Finally, we develop a system which supports the teacher in the instructional design process.

Introduction

In Japan, the subject "Information" will be studied in high school from April 2003. However, most of the teachers who will deliver "Information" are the incumbent teachers of other subjects because there are very few specialist teachers of "Information" as of yet.

Many instructors and researchers have published opinions about the various concepts of information education and relationships between these [2,3,5]. Most of these opinions showed factors which are useful for the usual instructional design process, such as situations and contents of education, in order to attain the educational goal. But it is also necessary, in the subject "Information", to add other educational goals which are related to the main goal of a unit, according to the contents of education and the situations of education too. But for teachers who are not specialists in information technology, it is difficult to even understand this problem.

To solve this problem, it is necessary to clarify and to tease apart the discrete concepts that compose information education. We think that this problem can be solved by applying ontology theory. Because, the ontology clearly describes the concepts and relations which exist between them and provides the joint ownership of the knowledge with common concepts between the persons. And regarding instructional design, not only the traditional process in which a teacher determines the strategies to employ to attain the goals of education, but also a more flexible process is necessary.

In this study, first we identify features of the subject "Information", by comparing it with other subjects, and propose an instructional design process model which is suitable for this subject. Next, we express the concepts which compose instruction, the concepts of the subject "Information" and the relations which exist between these, clearly and systematically based on ontology theory. Finally, we develop a system which supports the teacher of the subject "Information" to set goals in the instructional design process based on these concepts.

1. The instructional design model

An instructional design process model by Gagne is typical of one of the models presented so far [1]. This instructional design process model is composed of four levels. The instructional design process in this study focuses on the process that is involved from decision of the goal for a unit up to preparation of the instruction plan in the level of the instruction. The instructional design process of Gagne's model has five steps. These steps are 1,2,3,4 and 7. These meanings of the numbers are shown below:

1. The decision regarding the goal of the instruction.
2. The decision regarding the contents of the instruction.
3. The decision concerning the situation of the instruction.
4. The choice of the media for the instruction.
5. The addition and choice of the goal of the instruction.
6. The reselection of contents of the instruction.
7. The preparation of the instruction plan.

However, in the design process of the instruction, it is not only necessary to decide the instructional situations to attain the goal of a unit but also necessary to add the goal of the instruction which relates to its situations and the teaching materials based on constructivism. The Ministry of Education in Japan says that to deliver the several contents which relate to each other with the same teaching materials, across the unit, is also important [2]. Therefore, the step to add a goal of instruction according to the instructional situation and the teaching materials in the instructional design process is necessary too. For these reasons, we propose the instructional design process model which has the seven steps 1,2,3,4,5,6,7. In this model, two steps are added to the above model.

We think that this instructional design process can provide for a more effective instruction design whereby students can not only enhance the ability stipulated in a unit but also enhance other necessary abilities in the situations given. This is very important to attain the main goal of the subject "Information", that is, to enhance the ability to use information according to each situation.

2. The expression of the instructional model of the subject "Information"

We described an instructional model based on two ontologies from the instruction plan of the subject "Information" which was created by Okayama Prefectural Information Education Center[4]. We cannot explain these ontologies (the ontology of the structure of the instruction and the ontology of information education) in this paper.

Here, we explain the features and the advantages of the instructional model which is described based on the two ontologies. We presume that the teacher describes this model before preparation of the instruction plan. Its advantages are shown in the following:

- The teacher can describe the goals of education in each learning activity aside from the goal of a unit.
- The teacher can be clearly conscious of the goals of education, which otherwise are easily hidden.
- If a lot of these models are accumulated, teachers can refer to the true nature of the instruction (the goals of education) because the superficial information, which is about the type of the media and the learner's activities, does not confound them.

A proposed instructional model does not contain information about the instructional strategy. But, by accumulating both this instructional model and the instruction plan, the teachers can refer to the instructional strategy which is distinguished from the goals of

education. So, we think that this approach can promote the joint ownership and reclamation of the instructional model.

3. The approach for supporting an instructional design process

The functions of the support system which we build are shown in the following.

- The system shows the ontology of the information education to teachers simply.
- The system checks whether or not necessary minimum goals of education in a unit are prepared in the instruction model that a teacher has designed.
- The system checks whether or not an instructional model, which a teacher has established, satisfies a requirement to meet the goals of the education.
- After a teacher makes an instructional model, the system shows other goals of education that can be prepared and also relate.

The first function can be realized by introducing ontology which adds a detailed explanation of each concept to the public on a webpage. The second function can be realized by describing relations between the goals of education being pursued with each unit, and each concept of the ontology of information education. The third function can be realized by describing restrictions in the instructional model to attain each concept (a goal of education) of the ontology of information education. The last function can be realized by describing relations between each concept and between each concept and each learner's activity which relates with each concept.

4. Conclusions

In this paper, we proposed the instructional design process model adapted to the features of the subject "Information". Then, we presented two ontologies which provide the necessary concepts to describe the instructional model of information education based on this instructional design process. And, we explained that designing the instructional model based on these ontologies has some advantages. Furthermore, we showed the outline of the approach for supporting an instructional design process with the above two ontologies.

In future work, we intend to build this system and provide it for teachers of information education. Then, we want to evaluate and improve the system by analyzing the opinions of the respective teachers.

References

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