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Consideration for the Acquisition of the Concept of Object in the Robot Programming

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Abstract

An object is a data for one thing and that includes the operation or function of the things in computer science. When humans understand things he recognizes as a single object, rather than sequentially recognize the object. Because an object-oriented programming implemented on the basis of the object information is also similar to the way humans understand things, it is possible to solve familiar given problem by utilizing the object-oriented programming. Therefore, in this study, it has a purpose to find a method which can be easily accessed even young learners to learn the concept of object-oriented. To achieve the objectives, it was conducting research in the target 30 students for three years by 10 people per year. In results it was possible to discover some harder portion by a robot which is utilized to learn the concept of object but it is significant in that to facilitate access by utilizing robot concept learning and to present a learning method.

Keywords: Concept of Object, Programming, Robot, R-Toys

1. Introduction

Starting informatics focuses on improvement of problem-solving ability that utilize IT in ICT literacy education, the importance of programming has become relief[1]. By the programming education it has been mentioned that there is a positive effect, such as thinking development and improvement of the problem-solving ability to the learners[2]. Learners who received the programming education will enable algorithmic thinking and there is a positive effect on the improvement of creative problem solving ability[3,4].

With an announcement that the programming education has a positive effect in improving the thinking ability to the learners, education programming language has been proposed as the programming language that suits the learner[5]. There is a study comparing the kind of education programming language and there is also a case to be tried to apply, such as by education elementary school and middle school students[6].

Programming language, which is used as a current educational programming language, includes the concept of objects basically. Objects in the computer science mean that a single thing that has its data and functions. It was the mid-1960s when he object in computer science is mentioned for the first time[7]. As the object mentioned terms such as encapsulation and polymorphism were defined and the object-oriented concept was introduced[7].

Object-oriented programming is that programming to the objects one by one which are independent; it is also similar to the way humans perceive things in real life[8]. It seems that young children recognize a single thing and learning what it is. It means that this is high utilization to be able to help solve problems in real life. Currently there is a study that utilizes object-oriented programming targeted at elementary school[9], but it is difficult to find the studies that how to deliver the concept of the object how to see the exact concept delivered. Therefore, the

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purpose of this study, it is determined that it is important to focus on the part of learning the concept of object in programming education, is to propose how it should be access to the learners. In order to proceed with the class, it takes advantage of the robot as learners in contact with the first of the programming can be interested and it is preceded incorporating the opinion and evaluation of the learners, in a way to modify the learning content so as to be able to focus on the transmission concept of object.

In order to achieve the object, this study describes the related research in Chapter 2, presents the research methods in Chapter 3. Section 4 discusses the result of the programming, and Section 5 provide conclusions to draw the good striking form of learning in order to transfer a concept of a main object through the programming.

2. Related Work

2.1 Learning of the Concept of Object-Oriented

When programming: utilizing the object it is possible to properly implement if you know the properties and functions correctly by analyzing the object[10]. Also, the programming utilizing object is divided into each object, it is possible to represent a simple structure than procedural programming, and fewer maintenance costs. So it is often used in the field[11]. After knowing the usefulness of the "object" in South Korea, it was reflected in the information subject curriculum of high school[1]. In other words, the experts determine that the level of high school students is good to understand the 'object', to take advantage of it. There is also in the sense that it only to draw the understanding and interest in "object" in elementary school is not easy. However, it is in a similar way as to recognize the things in real life, good to understand the concept of the object as it is in contact from the time when young to understand the object[8].

There is a difficult to teach elementary school students are focused only on programming on to learn the concepts of object-oriented. So there are cases of the programming education by adding an interesting element of the game[12]. So that it can perform an understanding of objects for learning the concepts of object-oriented first, by utilizing modeling card, where it is added to the elements of the game, as it was observed to proceed so as to be implemented in programming languages it is there[12]. In understanding the concept of object, it may be a case of looking for ways to be able to easily access at primary school.

The concept of an object, a class, instance, polymorphism, encapsulation, and message passing[7]. The novice learner, addition of the word objects, also is not easy part to understand the words that represent the concept. Therefore, in this study, so that it can be passed easily notion of object novice students were selected programming language utilizing the object as a tool. And it is difficult to understand the concept of any object was to acquire only a part. Also, it was implemented to understand one concept for each one of content.

2.2 Robot Programming

Education can easily create access to low learner, in order to be able to learn the concept of an object, as indicated by studies in consideration modeling cards and game element, it should be taught how to school-aged low learner continuously research has been promoted[12]. In this study, as a tool to induce motivation given the interest in novice learners, it was utilizing the robot. By utilizing robot programming education, it is possible to induce an interest in the learner; it is possible to motivate[13–15]. Robot-based learning system, so can be controlled to have a lot of interest and curiosity, and such a positive effect to the classroom environment, and was reported to be possible to enhance the learning motivation of students[9,16]. In addition, by experience a variety of content, sometimes it is proposed that access to the robot programming can also be simplified[16]. That is, in the present study, by utilizing a robot to learn the concept of object can now be accessed with a stimulating and interesting.

It is also taken into consideration easy access learner selecting a robot programming language. Those that are most often used in robot programming language, there is a Lego Mindstorms[13,17]. As studies of Lego Mind storms progresses, that the NXT extends the functionality was also or developed[18].

In a programming language other robot, there is R-toys[19]. R-toys to meet the simulation function, even without putting instructions immediately to the robot after programming, can be viewed to check the operation of the robot in advance via a monitor[19]. Parts of the robot that is connected to the R-toys, since it is designed to express the robot moving like a LEGO Mind storms, a creative assembled possible. In the case of R-toys, to elementary school students, was conducted to evaluate the

ease of use as a programming language, and emphasized the part simulation function is included[20,21]. Therefore, in this study, it is determined that although programming education utilizing R-toys to explain the concept of the object in approaching aspects good for elementary school children, is to learn the concepts of object utilizing R-toys attempting to present a way to allow.

3. Method

3.1 Instructional Design

Define In this study, utilizing the robot programming, learners has a purpose to be proposed how it is better to access in order to be able to learn the concept of the object. To achieve the objectives, we carried out three times classes targeting elementary school 5th - 6th grade. It was conducting research in the target 30 students for three years by 10 people per year. Course content and the design are as Table 1.

When the primary classes, since the teaching of the robot programming to be carried out by schoolchildren to a subject in the first time to use the R-toys were mainly rely emphasis on how to control the robot. Also, we since an emphasis on robot control, what with easy access to the student robot programming if, taking into account whether you can be a robot control thought content. Afterward, students have progressed a personal project in order to investigate how are familiar with robot control. In a personal project, they made a robot that want to create them. Then, utilizing the R-toys, it was conducted in the manner seen by controlling the robot.

Secondary classes, out of the two contents that was utilized for primary classes, to explain the "Object" is added and changed by selecting a good content. It was applied to class by dividing the content into "fixed robot," "mobile robot" into the process. Also, we looked out to develop an evaluation form for each content item, students had to understand how to programming and understand the word 'object'.

In the tertiary class, the primary and by changing the overall content that was used in the secondary classes was combined focus to the description of the concept of object. We constructed so as to be able to explain the concept of one object for each content. And formation evaluation was modified so as to be able to obtain the concept of object. The concept of an object focused in tertiary classes is a message-passing, encapsulation, and polymorphism. Also, when they project: before the robot programming, with a time to try to write a project plan on paper.

3.2 Experimental Design

When for the purposes of the present study was an experimental design as shown in Figure 1.

First, after primary classes, we summarize the results of the pre/post student questionnaire.

Second, after secondary classes, we summarize the results of the pre/post student questionnaire.

Third, after tertiary classes, we summarize the results of the pre/post student questionnaire.

Forth, we were comparing the results from the primary to tertiary.

Fifth, for the tertiary classes with an emphasis on the

Table 1. Course content and design of each order

Order	Content Number	Projects	Number of Lesson	Special Points
1	2	O	12	Align the emphasis on robot; learn how to control the robot saw how to create a project of their own.
2	3	X	12	We went to modify the content that has been utilized in the primary lesson to the 'fixed', and 'mobile'. We were added to the formation evaluation for each content, and explained the 'message-passing' in addition to the term 'object'.
3	3	O	16	We have to modify the content so that it can be explained to put the concept of object. (message passing, encapsulation, polymorphism). We are not only a formative evaluation of programming for each content; it was also added formative evaluation to question the concept of object. When they project, before the robot programming, with a time to try to write a project plan on paper.

concept of learning object, it was sure that the student has been how to understand.

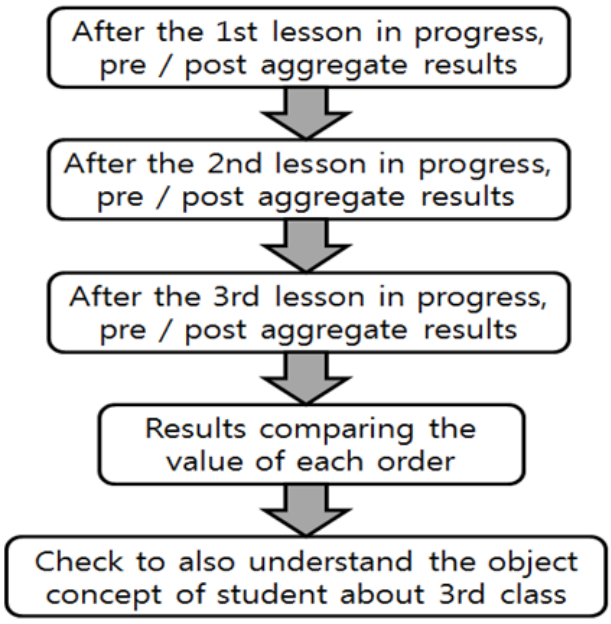

Figure 1. Experimental design.

4. Result

4.1 Survey Results for Tool

We tried to compare the recognition of pre and post recognition student of robot programming content from the primary that was created with the help of R-toys up to the tertiary. Pre-recognition and post-recognition are interest in robotics and programming, expectations in robotics and programming, and confidence in solving problems using the programming. Results of each order are the same as Table 2.

If you look at the results of the primary class with an emphasis on the robot, all it can be known that increased during post-recognition research than pre-recognition research, that interest in robotics and programming, expectations in robotics and programming, and confidence in solving problems using the programming. Especially, from the fact that the confidence for troubleshooting increased visibly, students can be interpreted as increasing self-confidence through the robot programming.

Since then, the second classes that began the concept of object enters a little, it is understood that interest and expectations for robots and programming is somewhat lower in the post as compared with the prior. However, confident for problem solving, but was higher in the 3.93 to 4.00, it is possible to determine that the interest and expectations were growing separately confidence.

Finally look at the results of the third class focused on learning the concept of object, and with confidence in to solving problems was not seen the high and low. However, Interest and expectations for robots and programming, it can be seen that it becomes lower than when the pre-recognition research. Especially, the concept of objects has become much lower than when a little containing the secondary. In the third classes that had a conception so as to be able to explain the concept of one object for each content, because the emphasis in the description of the concept of the object. So it is determined to be because he did not withdraw in the classroom of students favored direction of the robot.

Table 2. Recognition survey results for each order

Measure: M (SD)

		1st	2nd	3rd
Interest	**Pre**	3.50 (0.70)	4.00 (0.96)	4.28 (1.28)
	Post	3.60 (0.89)	3.98 (0.98)	3.92 (1.32)
Expectation	**Pre**	3.81 (1.18)	4.08 (0.63)	4.38 (1.29)
	Post	3.89 (1.21)	4.06 (0.81)	3.78 (1.31)
Confidence	**Pre**	3.66 (0.37)	3.93 (0.88)	4.00 (1.03)
	Post	4.00 (0.73)	4.00 (1.01)	4.00 (1.18)

4.2 Survey Results for the Object Concepts

Tertiary classes that was presented in the structure which can be one by one learning the concepts of objects per content one has performed a good survey to understand the concept of the object to the learner. After students hearing the class corresponding to each content, immediately how was satisfied with the content, and whether was able to understand how the concept of the object was lesson of the day represented by a 10-point scale. Set for each content is classified into 'concept acquisition of generic objects' can learn message passing 'fan', can learn encapsulation 'automobiles', it is possible to learn the polymorphism 'railroad crossing'. Each content whether how to help you understand the concept of objects, as a result of students were evaluated are as Table 3.

The results of the study, when learning object the basic concept of a general robot control showed a higher average result. However, the "fan" model starting the first learning the concepts of objects, sudden satisfaction decreases,

indicating a large number compared to the standard deviation than other content. This can be interpreted, rather than the concept of the object of message passing is difficult, because for the first time the concept of the object in contact with the robot assembly and robotic control. Students who showed a really low result was the answer to the thing it is difficult to control the R-toys alone.

Table 3. Each content object by concepts results

	General Object	Message Passing (Fan)	Encapsulation (Car)	Polymorphism (Crossing)
M(SD)	9.33 (1.00)	8.13 (3.18)	9.38 (1.77)	9.22 (1.72)

However afterward, it can be seen that the second example and the third example of the understanding result the concept of object utilizing case becomes high. That is, it can be determined that it is possible to be possible to control the R-toys, not feel the first so difficult to understand the concept of objects.

5. Conclusion

To teach the concept of an object in young learners, and not just as it can be learned even when utilizing an object-oriented programming language, there is a need for precise meaning transmission of the object. If it delivers only the meaning of the object, for students to difficult, there is also the study presented a learning method to teach the concept of object in addition the elements of the game[12]. This study takes advantage of the robot that can induce motivation and interest. The class was progressed by making the content to be able to learn the 'concept of objects' to students who are interested in the robot programming. The purpose is to offer a good way to learn to learners through the class.

As a result in the charged primary classes only in robot programming, it became well aware of the student, in addition to secondary classes and third-order class the concept of objects, recognition of students was reduced more and more. In particular, the three following classes, students showed low results replied that there is difficulty in robot programming, but they felt difficult because of trying to advance the robot programming by adding the concept of object.

When discussed based on the research results, it is as follows:

First: when the use of the robot programming in order to learn the concept of the object, they need to be familiar with the robot programming. For the first class which the results of the value after recognition survey of tuition that the rise expectations and interest in the class, confident to solve the problem together, it was not contained the concept of object at all. Therefore, by utilizing the robot to young learners, when teaching the concept of an object, it is important concept of the object, firstly, it is determined to be necessary to give the time to be familiar with robot.

Second, there is a need for activities that can clearly define the properties and functionality of the object rather than to learn the concept of objects naturally during the robot programming. This matches the part of the research that should be given priority activities to clearly define the properties and functions of the object and understand the concept of object when a young learners facing the class[12]. According to the results of the third class that it was able to focus on learning the concept of object, the learners felt difficulties overall than the first and second class. However, looking at the "result to understand the concept of object" of third class, they answered that it became like to understand the object from while taking the concept of object little by little.

Therefore, when utilizing a robot to teach the concept of the object it needs time to reach robot programming, rather than focusing on the part of teaching the concepts of object and it needs to proceed in the teaching of how to deal with the concept of the object later. In this study, there is significance in that it was presented learning method may be accessed as easy to understand the concept of objects to young learners.

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