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# The Human Development Process and Informatics Education in the 21st Century

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**Abstract.** This paper shows a basic discussion about the human development process described under the context of the postmodern knowledge society of the 21st Century. The author presents the concept of "the cycle of human development", which is believed to offer the basis of informatics education. In accordance with that, the presumptions of the pedagogical design of informatics education and its essential contents are also proposed.

**Keywords:** Leaning Process, Human Development, Otherness, Knowledge Society, Lifelong Learning

## 1 Introduction

The human development process in the 21st Century is thought to be described as a cycle process. In this discussion, human development is presented as a concept which stands for the positive transitions of maturity observed in various aspects of the human being such as intelligence, personality, skills, behavior, or knowledge. We argue in this paper that the human development in the 21st Century should be described as a cyclic process that includes these three steps of "encountering others", "discovering self inside others", and "reconstructing self", which the author calls "the cycle of human development".

"The cycle of human development" is an alternative to the linear and hierarchical human development model which was dominant in the 20th Century. In that era, the process of the human development was assumed to be a linear and hierarchical process which is expressed as the "start-to-goal" or the "lower-to-higher" model. These kinds of assumptions about the human development were the correspondence to the modern paradigm which was widely in common among the 20th Century societies. Under the modern paradigm, the public education system organized by the schools and its standardized curriculums was established on the basis of the linear and hierarchical structure. However, after the accomplishment of modernization, mainly around the western world, the linear and hierarchical education systems began to be insufficient to satisfy the complex demands of the society because of the change of social conditions that had justified modernization as a social objective.

In the following section, we will firstly show the theoretical background of the idea of “the cycle of human development”. Secondly, the details of the idea of "the cycle of human development", as a human development process of the 21st Century are discussed. Thirdly, we will argue how the pedagogical presumptions of informatics education should be described from the viewpoint of "the cycle of human development". Fourthly, we propose what we consider are the essentials of informatics education in the knowledge society of the 21st Century.

## 2 Theoretical Background

Psychological discussions of "self" give the basis of the idea of "the cycle of human development". Hermans and Kempen have conceptualized the conditions of polyphonic and multivoiced state of the self as "the dialogical self" [1]. The concept of the dialogical self shows a new way of understanding the relationship between the self and the others. According to the concept, the self contains plural positions and the dialogical relationship among the different positions constitutes the self. The dialogical self is thought to be a dynamic process that contains dialogical relationships between the self and the others inside of the same personality at once. This is also able to be understood as a concept that describes the state of the self kept affected by the others. If we regard the learning as a process of changing the state the self, the concept of the dialogical self will bring an insight of seeing the learning as a dialogical process that occurs inside of the human.

The idea of "the cycle of human development" is also affected by the discussions that relate to the modernized sensibility of "linear time". For example, Japanese folklore describes the concept of time held by the traditional societies as "cyclical time" that consists of the repetition of "Hare", which means the sacred time of the year, and "Ke", which means the secular time [2]. The concept of cyclical time is characterized by its own structure of involving the occasion of rebirth. Under cyclical time, the time of "Hare" functions as bringing new value from outside into the society and causing the symbolic rebirth of the society. This can be understood as a human's lifecycle of learning that consist of encountering others and bringing new value from those others.

## 3 The cycle of human development

As mentioned above, "the cycle of human development" consists of these 3 steps.

(1) encountering others
(2) discovering self inside others
(3) reconstructing self

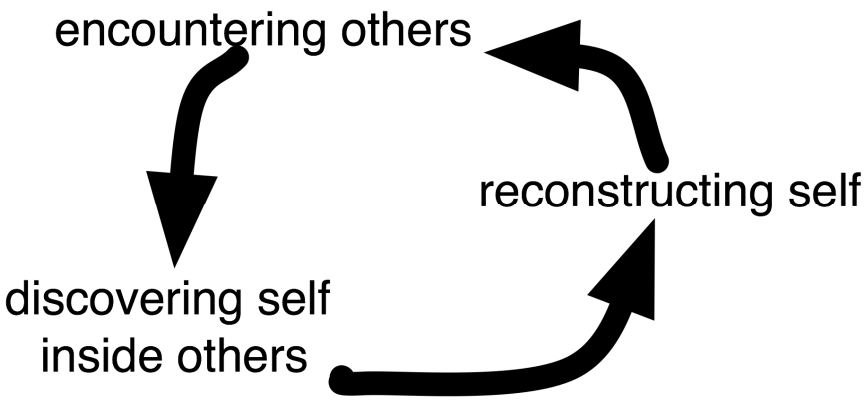



**Fig. 1**: The cycle of human development

The meaning of each step is to be understood as explained here. The step of "Encountering others" is considered as the beginning of the cycle. This step describes any of the situations in which we come to face someone or something we don't know, or haven't experienced in our daily lives. The concept of "others" here includes the nature or the personality we find newly inside someone or something we have already known. "Discovering self inside others" comes next. It is the step in which we discover something similar to or in common with ourselves inside "others" we have encountered. This step means the beginning of building a dialogical relationship with "others". "Reconstructing self" comes last. It is the step in which we reconstruct ourselves under the influence of the dialogical relationship with "others". Reconstruction includes not only a drastic change but also a subtle change observed in our daily lives, which occurs on our sense of value or the behavior toward something we think of as "others". It would also be the essential preparation for "encountering others", which comes next.

The idea of "the cycle of human development" comes from critical considerations to the limitations of the linear development model that is applied to human learning. The linear development model sees human learning as an optimized way of achieving pre-defined goals. While the stress of learning activities is put on the goal achievement, the value of learning processes is thought to be decided depending on the extent of the goal achievement. This model is suitable for the circumstance of the modern industrial society, where they can clearly draw pedagogical goals as requirements of the society. However, it is not suitable for the circumstance of the postmodern knowledge society, where clear-cut social goals cannot be formed and the stress should be put on the learning process itself rather than the goal achievement [3].

The idea of "the cycle of human development" is also based on the observations of the nature of the human development in reality. As mentioned above, human development means positive transitions of the maturity observed in various aspects of the human being such as intelligence, personality, skills, behavior, or knowledge. The shape of the cycle is thought to be the most suitable to express the nature of these

transitions, because their natures are to be understood thoroughly by using the metaphor of "the human life cycle". In this metaphor, their natures are commonly to be described as a process which contains "death and rebirth" in symbolic meanings. For maturity cannot be accomplished without an irreversible internal change of human nature, which can be compared to the symbolic "death and rebirth" upon the human life cycle.

## 4 The Pedagogical Presumptions of Informatics Education

From the viewpoint of building proper relationship between "the cycle of human development" and informatics education in the 21st Century, the author believes the three pedagogical presumptions listed here are required of informatics education.

(1) Informatics education should be designed to encourage the dynamism of the cycle.
(2) Informatics education should assume the human intelligence to be always under development and never to be completed.
(3) Informatics education should treat ICT as a means of bringing "otherness" to the learners.

Detail of each presumption is explained below.

Informatics education should be designed to encourage the dynamism of "the cycle of human development". As we know by the concept of “lifelong learning”, the process of human development is now expected to continue throughout human life. This process is to be expressed as a recurrence of the cycle. The author believes informatics education today has the mission of encouraging the dynamism of the cycle and supporting the lifelong learning as the recurrence of the cycle through providing the basic literacy of informatics.

For the sake of giving dynamism to the cycle, informatics education should assume human intelligence, in the broadest meaning, to be always in the state of underdevelopment and never to be completed. If we consider that the growth of human intelligence could have its completion, the process of learning is going to be designed as a linear path leading toward a clear-cut goal, which brings the learners to the end of their learning. If we wish to embody informatics education that has sufficient potential of encouraging the dynamism of the cycle, every process of learning should be practiced as continuous development of human intelligence that is never to be completed.

The author also believes that informatics education should treat ICT as a means of bringing "otherness" to the learners so as to encourage the dynamism of the cycle. The otherness means the essence that makes someone or something "the others" for us. It is often experienced as the feeling of unfamiliarity or un-understandability in our daily lives. The cycle begins from "encountering others" by the learners and thus, informatics education, which considers acquiring ICT literacy as one of the most important pedagogical purposes, is expected to be the key for the learners to go into the movement of the cycle; because ICT is capable of being learned as the media to bring otherness to the learners. On the other hand, if informatics education is

practiced lacking the sense of otherness, its potential of encouraging the dynamism of the cycle must be reduced.

## 5 Essentials of Informatics Education

The author believes that informatics education designed on the basis of the presumptions mentioned above is, at least, to have three essential contents listed below.

(1) Understanding the foundation of ICT
(2) Understanding information
(3) Producing information

### 5.1 Understanding the Foundation of ICT

Firstly, informatics education should provide the opportunity to understand the foundation of ICT. The foundation of ICT means the basic knowledge for learners to form the mental model of ICT that is appropriate enough to acquire ICT skills by themselves when needed. It does not necessarily mean the static and detailed knowledge obtained from the textbooks but also the working knowledge obtained from practical training.

The author believes that learning programming with small and simple tasks is the best way to obtain such knowledge [4]. In this context, programming means a series of operations that contain defining tasks to be processed by the computer, breaking defined tasks into several steps to form procedure, implementing programs by writing procedures with programming languages, and evaluating the validity of the programs as solutions to the tasks. The learners are expected to learn the principles that rule the functions of computers through the experience of programming, because it contains the opportunities to see and analyze the human tasks from the computer's viewpoint and check the validity of the analysis done. The purpose of learning programming should be put firstly on understanding the principles that enable computers to function, not on acquiring information processing skills.

### 5.2 Understanding Information

Secondly, understanding information should be practiced in informatics education. The concept of information stands for "the meanings or values for humans" here. Understanding information in this way is as essential for informatics education as understanding the foundation of ICT, for it is information as the meaning or the value that forms the purposes or the reasons to make use of ICT. From viewpoint of "the cycle of human development", understanding information is closely related to growing the essential capabilities of bringing dynamism to the cycle, such as the receptivity of the otherness and the appreciability of its value. This is because, according to the semiotic discussions, information as the meanings or the value is to be generated by finding the differences in the world around and articulating them with

symbols. This process is never to be enabled without the sense of the otherness supported by such capabilities.

We can learn pedagogical methodologies of understanding information from the practices of the fields of media education or media literacy affected by semiotic text critique [5]. In terms of media education, the foundation of information is to be explained using the semiotic terminologies that include "text", "code", "convention", and "context". In this practice, the text that brings information is assumed to be a series of representations constructed under the influence of the codes, the conventions, and the contexts. The methodologies of recognizing and analyzing the conditions that affect the constructions of the representations have already been established as school curricula [6].

### 5.3 Producing Information

Thirdly, producing information should be also practiced in informatics education. It should be practiced for obtaining the capability of seeking and establishing the proper relationship with the others that the learners have found. From the viewpoint of "the cycle of human development", self-reconstruction is to be achieved through seeking the meanings of something or someone discovered as unknown others. This can be practiced through constructing the representations on ICT because the process of the construction under the media-rich environment of ICT inevitably contains the occasions of choosing the symbols available to represent the object. What are constructed here should be exactly the representations of the relationships that the composer has established with the object as the others.

Constructing the representations as producing information is to be practiced by "mission" and "target" oriented composing curriculums. “Mission” is the concept that expresses the reason or the purpose of composing, which gives the necessity and meaning of composing. On the other hand, the concept of “target” means assumed audiences of the representations. These are to be the key factors for the learners to decide on for the design of the construction. In addition to that, for the learners, they are exactly the expressions of what we call the otherness because they are to be found only if the learners try to figure out with their own imaginations. Therefore the curriculum of constructing the representations should be started from analyzing and making definitions of the mission and the target.

## 6 Conclusion

We discussed how the human development process should be described in the knowledge society of the 21st Century. Responding to the research question, the author presented the idea of "the cycle of human development", which contains 3 steps of "encountering others", "discovering self inside others", and "reconstructing self". Discussions on the pedagogical presumptions and the essential contents of informatics education are also shown in this paper.

The idea of "the cycle of human development" is proposed in order to establish the principle of the pedagogical practices of informatics education in the postmodern knowledge society. Its essential significance is to be found on the fact that it is expressed as a "cyclical" process. Assuming that the human development process is a cycle, the focus of the pedagogical practice would inevitably move from goal achievement to the experience of the process and its dynamism. As referred above, this comparison is a correspondence with the transition of the pedagogical requirement from that of the modern industrial society to the postmodern knowledge society. Under the idea of "the cycle of human development", one of the most important missions expected of informatics education would be to help the learners obtain basic understanding of the concept of informatics and the foundation of ICT and encourage them to bring the dynamism to the cycle by themselves making use of information and ICT environment.

At this moment, the idea and the discussions presented in this paper are at the stage of proposals that are obtained from the author's experience of studying and teaching informatics toward the undergraduate and graduate students. The author recognizes that continuous surveys and detailed descriptions of pedagogical examples are required to confirm the presented idea and establish reliable principles from it. Researches and practices on these recognized problems are now ongoing. The author strongly believes that the results would be reported on the next paper.

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