Research Note

Informatics Education for the Democratic State of Society:

A Discussion on the Fundamental Reason and the Practical Aspects

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Abstract

How can we discuss the fundamental reason which gives an explanation as to why informatics education should be practiced in formal school education? In this article we are going to examine the manner of discussing 'the fundamental reason' in terms of a research topic of informatics education studies. As an investigation of the question, we attempt to give an interpretation of 'the reason' in terms of the relationship with the idea of democracy. In addition we refer to Amartya Sen and Martha C. Nussbaum's 'capability approach' to make clear the purpose of informatics education, which may take an important role of the realization of the democratic state of society. Following that, our expectations about the practical aspect of informatics education with democratic purposes are to be shown as; 1. Computer programming education for novice leaners to help acquiring general understanding of computing should be given higher priority in terms of the achievement of social justice. 2. The range of what we regard as the practice of informatics education should be expanded. 3. The role of non-formal education to expand the opportunity of learning informatics is to be more important.

Key words: Informatics education, computational thinking, democratic state of society, justice as fairness, capability

Introduction

In recent years educational programs about computing and informatics for general learners, which we[*] call 'informatics education' in this article, have become common as a subject of formal school education curriculums worldwide (Hromkovic 2006, Kalas & Winczer 2008, Romeike 2008, Sysło & Kwiatkowska 2008, Dagiene & Jevsikova 2013). However, the reason why informatics education has to be recognized as a school education subject has not been researched thoroughly in the field of informatics education studies.

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[*] The discussion shown in this article is totally formed with the contributions and inspirations given by the cooperators who work as practitioners in the field of non-formal education supporting vulnerable youths. Therefore 'we' is used in this article as the first-person pronoun just to indicate such contributions and inspirations given by them.

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It seems clear, especially for the informatics professionals' eyes, that acquiring knowledge, skills, and viewpoints of informatics may bring desirable influences to the learners' expansion of human intelligence and creativity.　In addition to that, many of us have actually come to realize the daily life depending on ICTs (Information and Communication Technologies) in various aspects.　There might not be any urgent necessity of asking why informatics education should be practiced in formal school education.　In accordance with that, the research topics chosen in the field of informatics education studies have generally been those concerning educational content or methodologies, in the broadest meaning, whilst the fundamental reason for informatics education to be practiced in formal school education has tended not to be chosen as a research topic recently.

We, as academic researchers of the informatics education studies, consider the examination of 'the reason' to be as indispensable as studying 'the content' or 'the methodologies'.　Because 'the reason' is supposed to be understood in various different ways and our basic conceptions of informatics education, which give a starting point of designing, planning, and assessing the practice to be done as informatics education, are thought to be affected mostly by how we understand 'the reason'.

Therefore, we attempt to present an example of the manner of discussing 'the reason' as a research topic of informatics education studies.　For the present we set a focus of our discussion on describing 'the purpose of informatics education' based on the critical interpretations of 'the reason', assuming that a description of the purpose of education, which is made irrespective of the subject, contains a total interpretation of the reason why such education is needed fundamentally.　More specifically, we are going to show in this article an argument about the possibility of establishing a general description of the purpose of informatics education, which is capable of being applied to as many societies as possible regardless of each local contexts.

Research Topics: Informatics Education's Democratic Purposes

As we see in John Dewey's *Democracy and Education*, considerations toward the fundamental reasons for various educational activities have long been done in connection with the idea of achieving democracy (Acemoglu, Johnson, Robinson & Yared 2005, Katz 2010, Samoukovic 2013).　Especially, for most of the societies which have been established on the basis of democratic values and political systems, the system of formal school education has been given the role of promoting the idea of democracy through fostering citizenship (Nussbaum 2006, Gozálvez 2011, Nikolakaki 2011, Martens, Room, & Gainous 2013).　On the other hand, the contribution of informatics education toward the proliferation of the social democratic foundations has not been well examined so far, for the majority of the educators and researchers tend to give attention to the aspect of technological or skill-oriented contributions.　However, if we attempt to give an account of the general value of informatics education as a subject of formal school education, we must

prepare to present the viewpoint which is beyond the provision of technologies and skills and enables us to think of informatics education with relevance to the fundamental values which are shared universally beyond the boundaries of societies.   Therefore, we believe that to elucidate the relationship between informatics education and democracy, which includes both theoretical and practical aspects, would be one of the most urgent research topics in the area of informatics education studies in order to advocate its justifiability as a public and universal issue that has to be addressed by the global society.

For instance, we have to prepare to answer the following questions which might be given from those outside the informatics-education-practitioners' community; why does teaching informatics have to be given certain priority despite various other educational topics, or why is it allowed to be placed and practiced in formal school education, which is supported by its government budget?   To answer these questions sufficiently, it is indispensable to present the logics which prove the connection of informatics education toward some universal values which we have to seek and show its justifiability as one of the public issues derived from such values.   Accordingly we assert that democracy is one of the most basic notions among such values.

In this article, we would show an outline of the study that we are conducting, which is about the construction of the logics providing a theoretical and practical basis between informatics education and democracy.   For the beginning, we put these research questions:

1. How should the purpose of informatics education be explained from the viewpoint of normative and practical contribution toward the achievement of the democratic state of society?
2. What kind of educational content should be given priority to be practiced in informatics education for the purpose?
3. How should we recognize and evaluate the learners' achievement in informatics education to make much account of the purpose?

Discussions: Informatics Education and The Theories to Justify the Execution of Social Policies

To answer these questions, we have started a survey about the theoretical frameworks that justify the execution of social policies obeying democratic manners of governance, which is mentioned as political liberalism.   The basic theory which gives a standard of the topic is that presented by John Rawls (2005, 2009).   Rawls has made clear the difference between the 'conception of the good' which is held by individuals and the 'justice as fairness' which is relevant to the social distribution of common goods as an essential precondition of individuals' pursuit of good, and argued that the justice should be given priority over the good for the sake of the democratic state of society.   In response to that, we have attempted to make a classification which separates informatics education for the justice from informatics education for the good,

by examining the nature of its purpose and content.

　　We also refer to the theory of the 'capability approach' presented by Amartya Sen and Martha C. Nussbaum.　This approach is concerned with the evaluation of a person's advantage in terms of one's actual ability to achieve various valuable functionings, which "represent parts of the state of a person - in particular the various things that he or she manages to do or be in leading a life" (Sen, 1993, p.31).　The approach focuses firstly on the assessment of the achievement of human wellness, which represents the realization of the democratic state of society, and from the viewpoint of achieving human wellness, the opportunity of receiving basic education is highly regarded.　At this moment, we assume that the purpose of informatics education should be conceived supposing the role of providing equal opportunity of expanding the capabilities relating to computing and informatics, for such capabilities are thought to be the keys of achieving the democratic state of society in the ICT age.

Extension of The Discussion: Practical Aspects of Informatics Education based on The Democratic Purposes

　　Our scope of the research includes not only making clear the theoretical basis of informatics education, which is described in a form of 'the purpose of informatics education', but also examining and reconstructing existing practices of informatics education from the viewpoint of the democratic purposes.　Our presumption is that if the relationship between informatics education and democracy is to be made clear, that will give a firm foundation for designing the practical aspects of informatics education.　However, for the present, our research is on the beginning stage therefore we have not yet figured out sufficiently the possibility of the democratic purposes being applied to the practice.　Consequently, we shall only refer to some of the expectations about the practical aspects of informatics education with the democratic purposes.　The expectations which we refer here are shown below;

1. Computer programming education for novice leaners to help acquiring general understanding of computing should be given higher priority in terms of the achievement of social justice.
2. The range of what we regard as the practice of informatics education should be expanded.
3. The role of non-formal education to expand the opportunity of learning informatics is to be more important.

　　Firstly, computer programming education for novice learners is to be given higher priority as the educational opportunity of fostering general understanding of computing, what we call 'computational thinking'.　The first reason is that to create the democratic state of society requires social diffusion of knowledge basis which is believed to be indispensable for the citizens to make reasonable judgments.　We argue that the general understanding of computing is to be a part of such indispensable knowledge basis for

the citizens to live and participate in the societies built upon ICT infrastructures. In addition to that, computer programming is relatively 'general' as a method of learning computing, which enables informatics education to be justifiable in terms of the Rawlsian viewpoint, if the educational program is prepared carefully for the sake of general education, not of the technical skill training for some specific technologies.

Secondly, the range of the categories to consider what kind of practices should be counted in as informatics education should be expanded. If the purpose is set upon improving human capabilities relating to the field of informatics or computing, which is intended so as to enable the citizens to participate and commit digital networked societies as fully responsible citizens, we have to admit the possibility of expanding the notion of informatics education and reexamine what kind of competence is essential for us to function in such societies. In this context we assume that computational thinking is still central but it should be linked to other related competence, for instance, critical thinking and creative skills, the former of which is to be connected with media and information literacy education (Wilson et al., 2013), and the latter connected with digital writing education.

Thirdly, the role of non-formal education, which is characterized as "learning and training that takes place outside recognized educational institutions"(Smith 2001), in providing opportunities of learning informatics and computing, will be more important to achieve equitable state from the viewpoint of accessing and participating in digital society, which is so-called 'digital equity'. Concerning informational capabilities, those who are not able to enjoy formal school education, which is officially approved educational institute by the government, are at the risk of being put at highly disadvantageous position of the society due to the lack of competencies which enables them to be given enough choices of living safely in the digital society. In order to realize the democratic state of society, it is crucial for the society to avoid arising of unreasonable social differences, an instance of which is known as 'digital divide' or 'social divide'. Therefore, the social scheme of non-formal education to help people in disadvantageous positions to acquire the capabilities of informatics and computing ought to be examined for the sake of the democratic purposes of informatics education.

Conclusion

As a conclusion, we shall refer to the plan of our research about informatics education with the democratic purposes. Firstly, we have to make clear the detail of the capabilities of informatics and computing. Our present conception is that a focus of the research should be put upon the social and individual conditions relating to the ICT and computing field which may promote the sustainable democratic state of society. Such conditions must be investigated from the viewpoint of supporting people in social, political, economical, and cultural participations as the citizens of democratic societies. In addition to that,

the practical aspects of informatics education should also be researched in more detail.　For the issue we are currently developing a programming course curriculum for novice learners which includes critical and creative orientations come from media and information literacy education, rather than technical orientation from ICT skills trainings, and also planning to survey the programs for socially vulnerable people to support social participation through leaning and playing with computers.

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研究ノート

社会の民主的状況の形成に向けた情報教育について：

その根本的理由と実践的側面に関する一議論

斎藤　俊則

　公教育において情報教育が行われるべき根本的理由はいかにして説明されるのか。本研究ノートでは、情報教育研究のリサーチトピックとしてこの問いを扱うための手順を論ずるとともに、筆者らの現時点での問いに対する展望を示す。すなわち、筆者らはこの問いをより普遍的な価値すなわち民主主義の理念との関係から考察するとともに、民主的な社会形成の基盤におかれるべき原則をA. センと M. C. ヌスバウムによるケイパビリティ・アプローチに求める。その上で、ケイパビリティの拡大によって民主的な社会状況の形成に資するという、公教育における情報教育のあり方の可能性を論ずるとともに、その実践的側面として 1. 社会的公正の見地からは初学者がコンピュータへのジェネラルな理解を持つためのプログラミング教育に力点が置かれるべきである、2. 情報教育として考察されるべき範囲を拡大すべきである、3. 情報学の学習機会の拡大の観点からノンフォーマル教育の役割が今後ますます大きくなる、という 3 点の指摘を行う。

Toshinori Saito's Research Note: Informatics Education for the Democratic State of Society: A Discussion on the Fundamental Reason and the Practical Aspects

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This research note deals with an important topic in this digital age.　In it, Mr. Saito pursued the reason why informatics education should be included in formal schooling, using principles of democracy and capability approach.　In a nutshell, he argued that informatics education is indispensable as a subject in formal schooling as it can help people to be capable individuals who can contribute to the maintenance and development of democratic society.

This is an ambitious piece, and I congratulate him for writing it in two respects.　First, the mere fact of writing it in English is laudable.　It is a formidable task for Japanese scholars to write academic journal articles in English, and many people simply shy away, but he did it in a masterful way.　He has attended an annual conference of an international association on key competencies in informatics and ICT for the past few years, and I am sure his experience in attending and presenting at such international conferences has motivated him to write in English.

Second, in terms of the contents, it was great that he examined the reason why informatics education is necessary in formal schooling in relation to maintaining the democratic state of society.　The relationship between informatics education and democracy needs to be explored in this digital age.　Moreover, I found it intriguing that he not only discussed a theoretical basis of informatics education, but also made an attempt to present "expectations" about practical aspects of it, which are tied to democratic purposes (p. 3).　Especially, I agree that the role of non-formal education is likely to increase, as problems of digital divide, inequalities of educational opportunities, etc. seem to have intensified, and can jeopardize healthy development of democracies.　His careful consideration of informatics education in the global context is instructive.

Although this research note is well-written, there are a few things that need to be considered.　Mr. Saito used a normative approach to come up with the reason why informatics education is necessary and to discuss ideal forms of informatics education in practice deduced from the theory.　At the same time, he stated at the outset that "educational programs about computing and informatics for general learners…have become common as a subject of formal school education curriculum worldwide" (p. 1), and suggested that there are many studies on their "content or methodologies."　From the article, I can sense that he is a little critical of the current status of informatics education focused on "technological or skill-oriented contributions" (p.2), but if informatics education is already common as a subject in formal schooling worldwide, it seems necessary to examine the existing literature on informatics education as well and possibly compare it with the ideal forms of informatics education that he presented here.

I also have several questions with regard to the contents of this article.　Although he mentioned that he wants to develop a theory that can be applied to any society, can his argument be applied to any society in the world?　Is it only applied to democratic societies?　Can it be applied to developed countries *and* developing countries?　How many years should informatics education be conducted, and from what grade to what grade?　What is the current status of informatics education in Japan?　A list goes on.

I assume that this article is the first step in a larger long-term research study on informatics education, involving other researchers and practitioners (as it is written as "we"), and I look forward to reading future articles of this research project, which I am sure will answer many of my questions presented above.