A review of Jerome Bruner's educational theory : Its implications for studies in teaching and learning and active learning (secondary publication)

〔Translation〕

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Abstract

This article reviews Jerome Bruner's educational theory in reference to his life works to discuss its implications for studies in teaching and learning, and active learning. Throughout his life, Bruner studied the dialectic between the past/present and the possibilities in the interaction between human beings and cultures, and the duality of acquiring and creating in learning. On the basis of these lifelong studies, Bruner formulated his pedagogical ideas. On the other hand, it was through the noticeable changes in his extended view of learning and culture that he came to acknowledge the social side of learning, the significance of contextual learning, and the multiplicity of representation. In the current article, claims against the common view of Bruner's educational theory will be examined. Furthermore, the current article will discuss his educational theory with reference to the general findings of cognitive science, which his claims correspond to, on the whole. It is time for modern education to benefit from his educational theory and catch up with the advances in cognitive science and active learning.

Keywords: Jerome Bruner, Educational Theory, Studies in Teaching and Learning, Active Learning,
　　　　　Cognitive Science

教育理論における Jerome Bruner の功績をたたえて
──教授・学習学やアクティブラーニングへの示唆──
（二次出版）

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1 Introduction

This article reviews Bruner's educational theory in reference to his lifelong work, including his psychological studies, to discuss the implications of his claims for studies in teaching and learning (both methods and curricula) and active learning.

Bruner died at the age of 100 in June 2016. He was known as a pioneer of cognitive and cultural psychology. He also wrote many essays on education and was deeply involved with curriculum development, such as "Man: A Course of Study" and educational practices such as the Head Start Program.

The author wrote the current article because Bruner's works, not only his famous ideas such as discovery learning and structures, have many implications for studies in teaching and learning and active learning.

There are many previous studies on his educational theory both within and outside of Japan, although the author cannot read all of them. They include Olson (2007), who discussed the relation between his theory or educational practice and other theories, and Gardner (2001), who reviewed his career from the perspective of educational theory and practice. With a different perspective from those articles, the current article focuses on his ideas about teaching and learning.

Previous studies, at least those that were possible for the author to read, have common points: on structures as being the inside of subject matters, on his theory of education as the force that adapts individuals to their cultures, and on Bruner as an essentialist who claimed the need for discipline-centered curricula (Sato 1968, 1986; Brameld 1971; Tanner and Tanner 1989; Ishibashi 1997; Olson 2007; Takaya 2008; Shimaguchi 2012. However, Takaya and Shimaguchi held this view of the matter of until the 1960s). Mizukoshi (1977) also recognized the existence of such views.

The author claims that this limited view cannot grasp Bruner's intention. The author will present a contrasting view in reference to other studies.

2 Bruner's fundamental ideas

Here the author discusses Bruner's fundamental ideas.

The aim of Bruner's study was to construct the theory of human cognition that is interwoven in cultures.

According to Bruner, humans are characterized by the capacity of creating ourselves "by the constitutive power of our symbol-making, our institution-creating, our very culture-creating" (1983: 278), namely, the capacity to construct "possible worlds" that transcend biological limitations (2012a: 6). Bruner (1986: 130) called himself a constructivist who believed we construct or constitute the world and self by ourselves.

On the other hand, Bruner stated, a culture "shapes our conception of what can be taken as customary or ordinary and creates institutions to stabilize this ordinariness" (2005a: 56), and represents "the patterned ways of everyday life" (2006: 13). By its functions, culture gives human beings images, skills, conceptions, and so on, and empowers them (Bruner 1966d: 321). At the same time, it restricts an individual's acts.

In sum, human beings and cultures depend on each other. "Mental growth comes as much from the outside in as from the inside out" (Bruner 1983: 278). Bruner said that he had had a firm belief in this interdependence since the 1930s (Crace 2007).

Consequently, Bruner regarded learning as a creative process to transcend culture while inheriting it. "The mind is designed to explore possibility" (Bruner 2012b: 29), and " 'learning' is, most often, figuring out how to use what you already know in order to go beyond what you currently think" (Bruner 1983: 183). In other words, learning is a constant process of pursuing possibilities in a culture when acquiring the culture. This is creativity as a basic feature of human learning.

In the same way, Bruner (1996: 43) stated education "is a complex pursuit of fitting a culture to the needs of its members and of fitting its members and their ways of knowing to the needs of the culture," and emphasized the individual's creation through inheriting culture in education. Bruner (1959: 192) stated that we need to judge our students on not only what they know but also on what they can generate from what they know.

Therefore, "possibility" is the basis of Bruner's view of human beings. This is the possibility of what learning can create, and of human development and social development.

Human beings live with the dialectic between human history and the possible self (Bruner 1996: 36). Bruner stated, "the life of mind is a never ending dialectic between the ordinary and the possible" (Bruner 2005a: 58). So is a culture, too.

In conclusion, Bruner tried to understand the mechanism of human development through creation in the interaction between human beings and cultures, and studied the dialectic between the past/ present and the possible. He also studied education as an essential element of this interaction.

3 Some features of Bruner's theory

Along with the above fundamental ideas, he constructed his own theory based on the findings of experimental studies on cognition, while often claiming that psychology had to take into account the findings of related disciplines (Bruner 1983: 280, 2012a: 9). He conducted many of these studies himself.

Okamoto et al. (2004) called his interdisciplinary stance "eclectic." In short, this is "not only A but also B," such as "not only internalization but also externalization" and "not only psychology but also related disciplines."

Okamoto et al. (2004: 298–9) also stated, "Bruner seemed not to care about theoretical exactness or rigorous consistency in his theory [...] Bruner never takes sides, specific theoretical purity or shortsighted experimental innocence" (dots over the letters deleted). The author agrees with this statement, because Bruner recognized himself that there were "struggles and muddles throughout these essays" (1973: xii).

When discussing his educational theory, we have to take into account the findings from his experimental studies on cognition. We also have to grasp the whole aspect of his theory, with understanding of his intention to give priority to integration between theories, regardless of partial inconsistency.

4 Reviewing Bruner's educational theory from the perspective of teaching and learning

On the basis of Bruner's fundamental ideas and the features of his theory described above, the author reviews his educational theory from the perspective of teaching and learning.

4.1 The duality of *structures*

In general, *The process of education* (Bruner 1977) is regarded as the representative work of Bruner's educational theory. However, this was the report of The Woods Hole Conference, which discussed educational reforms, and was arranged by him. As Mizukoshi (1977) claimed, it is impossible to regard the whole of the report as his ideas.

In the book, one of the pedagogical concepts is *structures*. Bruner (1977: 19) discussed the design of curricula that is true to the underlying structure of subject matters. In brief, he argued on the structures of *subject matter* here.

On the other hand, Bruner stated, "grasping the structure of a subject is understanding it in a way that permits many other things to be related to it meaningfully" (1977: 7). Here, he argued that *a learner* grasped and understood the structure.

Structures have two meanings, structures of both *subject matters* and *learners*. Mizukoshi (1977) described the possibility of interpreting it thusly.

Bruner (1973: xi) described this duality as follows: "our knowledge of the world is not merely a mirroring or reflection of order and structure 'out there,' but consists rather of a construct or model that can, so to speak, be spun a bit ahead of things to predict how the world will be or might be" (italics deleted).

Taking account of the duality, we can better understand the features of the *structures* described by Bruner. "Since the merit of a structure depends upon its power for simplifying information, for generating new propositions, and for increasing the manipulability of a body of knowledge, structure must always be related to the status and gifts of the learner. [...] the optimal structure of a body of

knowledge is not absolute but relative" (1966a: 41).

The three powers of the *structures* are not only what structures of subject matters give learners but also what leaners can use by establishing his/her own structures. Curricula must be a "generative kind [for learners] that permits reconstruction of the details or, at [the] very least, prepares a place into which the details, when encountered, can be put" (Bruner 1979: 121).

Further, because the *structures* to be taught are influenced by the status and gifts of the learner, we need to develop a spiral curriculum that turns back on itself at higher levels (Bruner 1977: 13).

4.2 *Discovery*

The concept of *discovery* is also found in *The process of education*. *Discovery* is "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence so reassembled to new insights" (Bruner 1979: 82–3).

It is also related to skills such as pushing an idea to its limit, making a hypothesis, and condensing information (Bruner 1973: 77–9). These skills correspond to the powers of *structure* described above. *Discovery*, thus, is a means of acquiring these powers.

However, already established structures of subject matters are *not* what learners discover by themselves to acquire but materials for *discovery*. That is because "we even learn much of what we 'know' about the *physical* world by hearing others' beliefs about it, not by poking about in it directly" (Bruner 1996: 178).

In *discovery*, the psychological rewards from such discovery motivate the learners. It is the shift from extrinsic to intrinsic rewards in learning that is one of the advantages of *discovery* (Bruner 1979: 83).

4.3 Intuition in *discovery*

Intuition plays an essential role in *discovery*.

It is the act or the intellectual technique of arriving at plausible but tentative formulations and grasping the meaning, significance, or structure of a problem without going through the analytic steps (Bruner 1977: 13, 1979: 102). It includes attitudes such as "an expectancy that there will be something to find" (Bruner 1979: 84–5).

However, intuition is NOT free and ungoverned thinking. Rather, it is "a shortcut based on an informal and often inexpressible structuring of a task" (Bruner 1973: 85) and is derived from an unconscious part of the individual's structure.

Intuition also generates mistakes. Teachers have to distinguish an intuitive mistake from a stupid or ignorant mistake and give approval or correction simultaneously to the student (Bruner 1977: 68).

To summarize, for Bruner, intuition is a method of advancing cognitive development by creative thinking beyond present cognition. In other words, "intuition is an invitation to go further" (Bruner

and Clinchy 1966: 76).

Further, Bruner (1973: 83–5) described the nature of intuition in detail.

4.4　Bruner's hypothesis

In *The process of education*, it is stated as a hypothesis that "any subject can be taught effectively in some intellectually honest form to any child at any stage of development" (Bruner 1977: 33). In other words, Bruner (1966a: 35) held that, "there is an appropriate version of any skill or knowledge that may be imparted at whatever age one wishes to begin teaching." This is referred to as "Bruner's hypothesis" in this article.

Regarding Bruner's hypothesis, Bruner (1971: 21) explained, "this did not necessarily mean that it could be taught in its final form, but it did mean that basically there was a courteous translation that could reduce ideas to a form that young students could grasp." In Bruner's hypothesis, the key of teaching is to create a translation to enable the learners to understand advanced ideas.

4.5　Readiness

Bruner (1996: 119) described readiness as another way of stating Bruner's hypothesis. Bruner's hypothesis also expresses this view of readiness.

According to Bruner, it "consists of mastery of those simpler skills that permit one to reach higher skills" (1966a: 29) and "is a function not so much of maturation as it is of our intentions and our skill at translating ideas into the language and concepts of the age level we are teaching" (1979: 108).

That is because scientific ideas "can also lead intellectual development by providing challenging but usable opportunities for the child to forge ahead in his development" (Bruner 1977: 39). In short, "readiness is not only born but made" (Bruner 1996: 119).

His view of readiness also expresses "possibility," one of the fundamental ideas in his theory.

4.6　The extended view of learning

Because Bruner early thought it was most important for human cognition to acquire and use conceptions, he emphasized the concepts of *structures* and *discovery*. "The power of great organizing concepts [...] permit[s] us to understand and sometimes to predict or change the world in which we live" (Bruner 1979: 120). Moreover, "we honor that capacity by learning the methods of compacting vast ranges of experience in economical symbols" (Bruner 1979: 6–7). In the same way, Bruner (1968: 71) regarded schools as where students studied decontextualized ideas and thinking.

However, Bruner's view of learning is largely extended through what he studied in the 1970s, such as joint attention (Scaife and Bruner 1975), the role of joint attention and activity in language development (Bruner 1975), and scaffolding (Wood et al. 1976). It was accompanied with an extended view of culture. Bruner (1996: xiii) stated this extension was influenced by poverty and racism in the

United States.

Bruner (1996: 39) also stated, "I still hold firmly to the views expressed in my earlier work about subject-matter teaching," such as *structures*, *discovery*, and spiral curricula. The extension means that he added three new points as follows to the view that he held until the 1960s.

4.6.1 Learning as a shared activity

The first point Bruner added was a focus on the communal or social side of learning. As Bruner stated, he gave up the traditional model of the solo child mastering the world by representing it to himself in his own terms and came increasingly to "recognize that most learning in most settings is a communal activity, a sharing of the culture" (1986: 127).

In fact, Bruner (1979[1962]: 123) stated, "a method of instruction should have the objective of leading the child to discover *for himself* " (italics added). But Bruner (1986: 127) came to "emphasize not only discovery and invention but the importance of negotiating and sharing—in a word, of joint culture creating."

Therefore, he stated, "It is not just that the child must make his knowledge his own, but that he must make it his own in a community of those who share his sense of belonging to a culture" (Bruner 1986: 127). Moreover, "much of learning depends upon the need to achieve joint attention, to conduct enterprises jointly, to honor the social relationship that exists between learner and tutor" (Bruner 1977: xiv). Sources of motivation to learn include the sense of belonging to communities such as the "learning community" (Bruner 1966a: 126). They also include relation to others and communication with them, which generate a sense of belonging.

Consequently, for Bruner, cultures are created not by the solo individual but jointly through learning as "an interactive process in which people learn from each other" (1996: 22). Described above, Bruner already had a firm belief regarding the interdependence of human beings and cultures since the 1930s. In the 1970s, this belief was exhibited explicitly as a more consistent theory.

Bruner's extended view of creating a culture is critical for his theory. In so far as we take into account the social side of learning, we can grasp the process of culture not only relatively continued but also changed. The model of solo learning, which results in each person externalizing their own structure acquired selectively from cultures, cannot explain the process.

4.6.2 The multiplicity of representation

The second point that Bruner added was a focus on the multiplicity of representation.

Bruner (1966a: 44–5) asserted that cognition consists of enactive, iconic, and symbolic representation. Enactive representation means that the human represents the world through actions; Bruner was the first psychologist to employ the concept of enaction in this way (Ruiz and Linaza 2015).

In cognition, these three representations were used interactively (Bruner 1966c: 48). Although Bruner (1966b: 1) stated that they were developed in the order of enactive, iconic, and symbolic, he

(1966a: 28) maintained, "it is not that these are 'stages' in any sense; they are rather emphases in development." Bruner (1996: 155) clearly denied regarding them as developmental stages.

Bruner studied not only symbolic representation but also the multiplicity of representation including enactive and iconic representation. For example, Bruner (1996: 155) reacknowledged the significance of iconic representation.

4.6.3　Learning contextually

Finally, Bruner added a focus on learning contextually.

Bruner (1973: 125) described the conflict in the need for learning between societies and individuals, which occurred through the decontextualization of learning in the societies where school is the center of education. This is symbolized by children's lack of motivation to learn, caused by poverty and social alienation in the United States at the time (Bruner 1971: 26).

Bruner (1973: 115) claimed the necessity for settling this conflict. As one of the solutions, Bruner (1971: 27) proposed the curriculum in which immediate and compelling concerns are given a central place. Because he never elaborated on this concept, the proposal can be regarded as casual.

Therefore, what the proposal means in Bruner's educational theory is more important than the contents of the proposal. That is to say, Bruner acknowledged the value of contextual learning with clear purposes and associated with actions, although he had rated decontextualization higher in human intelligence.

In short, Bruner (1985: 104) stated clearly, "children begin to use language, [...] not because they have a language-using capacity, but because they need to get things done by its use." By replacing "language" with concepts, it can be said that the things they need to do by the use of concepts, namely contexts, motivate them to learn.

4.7　Narratives

Since the 1980s, Bruner discussed narratives (using story and story-telling interchangeably).

Bruner described narratives and science as "two modes of cognitive functioning, two modes of thought, each providing distinctive ways of ordering experience, of constructing reality" (1986: 11). In other words, the former is an exemplification or interpretation and the latter is a generalization or explanation (Bruner 2012b: 31, 1996: 92). "The two (though complementary) are irreducible to one another" (Bruner 1986: 11). We should manage to live with both (Bruner 1996: 114).

The relation between those two corresponds with the one between contextual learning and decontextual learning, described in 4.6.3. For Bruner, narratives are another conceptualization of contextual learning.

Narratives have been widely used in the social sciences since the 1980s (Murray 2015). They were not used originally by Bruner. However, there are many pieces of his thinking directly related to narratives in his works before the 1980s. For example, Bruner (1965: 45–6) described the role of

narratives in our lives and their use in teaching literature and drama. Narratives are also the idea through which he reconstructs his theory.

A narrative "deals [...] with the stuff of human action and human intentionality," and "mediates between the canonical world of culture and the more idiosyncratic world of beliefs, desires, and hopes" (Bruner 1990: 52).

Narrative thinking is "the easiest and natural way we organize things" (Bruner 2012b: 29), but it does not mean that everyone can acquire the more sophisticated form (Bruner 1996: 40). Feldman et al. (1993) investigated narrative thinking in children, teens, and adults. They found a qualitative difference between them. This finding indicates the possibility for educational interventions to cultivate narrative thinking.

Narratives play the only role in the construction of individual identities and the finding of a place in one's culture that has not been replaced by science (Bruner 1996: 42, discussing in detail in the chapter 3 of Bruner 2003). Schools must help students find identities within their culture (Bruner 1996: 42).

4.8　Folk psychology/pedagogy as intersubjectivity

Bruner described the mechanism sustaining learning as an interactive process, namely, intersubjectivity. It enables us to know and share in each other's mental lives (Bruner 2008: 35).

Intersubjectivity is based on the rewarding effect inherent in a shared action (Bruner 2008: 36). It is developed through the joint anticipatory system in the action (Bruner 1985: 27-8).

It is folk psychology that sustains the shared action. It is "a set of more or less connected, more or less normative descriptions about how human beings 'tick,' what our own and other minds are like, what one can expect situated action to be like, what are possible modes of life, how one commits oneself to them, and so on" (Bruner 1990: 35).

Folk psychology not only reflects the cultures it comes from but also is created by individuals in the same way as interaction between human beings and cultures. Everybody should be a psychologist, in that everybody has theories about why others are acting as they do (Bruner 1996: 162).

Even though he used the word "psychologist," it does not mean that folk psychology is scientific. It is "narrative in nature" (Bruner 1990: 42).

Folk psychology is also equipped with notions about how the child's mind learns and even what makes it grow (Bruner 1996: 46). These notions are folk pedagogy, a part of folk psychology. Teaching is inevitably based on folk pedagogy (Bruner 1996: 46-7).

There are four dominant models (learners' mind=purpose of educating) in folk pedagogy (Bruner 1996: 53-63). They are: 1) children as imitative learners=the acquisition of "know-how"; 2) children as learning from didactic exposure=the acquisition of propositional knowledge; 3) children as thinkers=the development of intersubjective interchange; 4) children as knowledgeable=the

management of "objective" knowledge. We need the four perspectives to be fused into some congruent unity (Bruner 1996: 65).

5 Implications by Bruner for studies in teaching and learning

The aim of this article is to apply Bruner's theory to develop educational practices and construct useful pedagogical ideas or theories for the practices than understanding his thinking precisely.

As a part of the ideas, the author described "developmental performative teaching and learning (DPTL)" in Matsumoto (2016a).

The author discusses the implications of Bruner's educational theory for studies in teaching and learning and active learning, in reference to his works and other findings in cognitive science.

5.1 Acquiring the powers of *structures* through *discovery*

According to a review of cognitive science (Bransford et al. eds. 2000), the key principles of experts' knowledge are: by organizing around important ideas or concepts with chunking information into meaningful patterns, they have more conceptual chunks in memory, more relations or features defining each chunk, more interrelations among the chunks, and efficient methods for retrieving related chunks and procedures for applying these informational units in problem-solving contexts.

These findings indicate the significance of learners building their own structures independently, although with others' help. It also corresponds with Bruner (1979: 96), as he stated, "material that is organized in terms of a person's own interests and cognitive structures is material that has the best chance of being accessible in memory," namely, the aid to conserving memory as an advantage of *discovery*.

Acquiring the powers of *structures* through *discovery* refers to learners building their own structures with the help of others or using the structures of subject matters.

When teaching, we have to assure the learners that *structures* are useful in constructing *their own* possible worlds. Here, context plays an important role. This will be described in more detail later.

We need to discuss the method of grasping learners' structures. Even though a learner may possess a lot of knowledge, it does not follow that s/he has a good structure. There are recommended methods to build and evaluate structure, such as by explaining the meanings of concepts in their own words and making mind maps.

5.2 The use of metaphor in Bruner's hypothesis

According to the findings of cognitive science (Imai 2016), we understand new knowledge from our intracerebral networks of prior knowledge, namely, a schema.

It is appropriate that we can acquire new knowledge beyond the schema by translations linking

with prior knowledge, as Bruner's hypothesis claims.

It is metaphor that is used in the translations. It produces a compact image or symbol that travels great distances to connect ostensible disparities (Bruner 1979: 65). It is also an active and heuristic way of knowing and enables us to understand incomprehensible things concretely and satisfactorily (Yamanashi 1988). It mediates between prior knowledge and new knowledge.

Metaphor mediates not only concepts. Metaphoric cognition includes empathy and personification (Yamanashi 1988). Metaphor also mediates between our selves, both bodies and minds, and the world. It is a way of knowing *with one's own body* (Matsumoto 2016a).

According to the findings of a survey of mathematicians born or residing in the United States, they avoid the use of mental words and the mental use of algebraic or any other precise signs in mathematical inventions; they use vague images (Hadamard 1945). Albert Einstein, a physicist, used music in scientific imagination (Root-Bernstein and Root-Bernstein 2010). Bruner's (1977: 14, 28, 1979: 126) claim that there is no difference in kind between a scientist and a young student in learning includes at least the meaning that metaphor is an essential element of learning.

The essence of teaching is using metaphor. Studies in teaching and learning should collect and analyze cases of using it in practice.

5.3　Intuition

Kay (2015) claimed that we think about not just for "System 2" to learn how to think slowly and carefully but also for "System 1" to learn how to "think fast." Kay also claimed intuition is a way of "System 1." He implicitly criticized the general teaching methods depending on "System 2" only. Intuition is a methodological idea for alternatives.

Intuition, stemming from an unconscious part of the learner's structure to achieve understanding of a new idea, is thinking in which the use of metaphor is an essential element. In other words, it is using metaphor that makes the learners understand by "System 1" with translations in Bruner's hypothesis.

5.4　Variously using of representations

We come to know that the use of enactive or iconic representation in teaching helps to acquire symbolic representations (Fyfe et al 2014). It is important for learning to acquire and retain not only symbolic representations but also enactive and iconic ones.

Schools have to teach the three representations, Bruner described, in a well-balanced manner. We have to take into account the circumstances of modern people. As we, including children, lack exercise, opportunities to use enactive representation decrease. Moreover, the younger (so-called "smartphone") generation in Japan seems to depend on only texts in daily communication and not to understand symbolic representation *with the body*, because of the advances in information technology.

On the other hand, as the advances enable us to stock and exchange pictures easily, the opportunities to use iconic representation also increase.

The author is still unable to judge whether all three are types of representation. At least, music representation may be added to the list.

In any case, studies in teaching and learning need to develop teaching and evaluating methods to foster various forms of understandings from the viewpoint of the multiplicity of representation. In particular, useful methods for teachers to directly grasp or evaluate the enactive or iconic representation that learners acquire need to be studied.

5.5　Fostering competence to understand narratives

Using narratives in education plays at least three important roles.

First, fostering competence to understand narratives by using narratives contributes directly to making our lives meaningful and fostering intersubjectivity.

Second, scientific understanding requires narrative understanding. That is because we (both scientists and the students in classrooms) understand science through the use of narratives (Bruner 1996: 125).

We have to link properly the narrative side of teaching to the scientific side. If not, learners stay in the narrative side. Narratives are a ready and supple means for dealing with the uncertain outcomes of our plans and anticipations (Bruner 2003: 28). They also offer a sufficient means for us to deal with familiar routines (Bruner 2003: 4). Reif and Larkin (1991) discussed in the same way the significant difference in the meaning of the validity between everyday life and the domain of science. We can live without scientific thinking, but it makes our lives narrower (Bruner 2003: 102).

For example, university students tend to write reports with reference to web resources only. This is partly caused by the fact that they obtain sufficient validity in their everyday lives from them. They stay in the narrative side. Although they enter university, it does not follow they smoothly participate in the scientific side.

Third, narratives provide a vehicle for teaching about possible worlds (Bruner 2005b: 62). This means a method of teaching competency to imagine a possible self living in possible worlds, and motivates learning (Matsumoto 2016a). The use of narrative is thus a means of motivation.

Studies in teaching and learning need to develop such practices using narratives.

For example, New York University's webpage (http://www.nyu.edu/faculty/teaching-and-learning-resources/strategies-for-teaching-with-tech/storytelling-teching-and-learning.html, 2016.10.19 access) teaches the methods of using stories in teaching scientific ideas with examples.

As teaching materials, we can use the arts, composed of a story, such as novels, dramas, movies, anime, manga, and songs (e.g., Matsumoto and Ieshima 2013).

5.6　Expression activities by language

Bruner, such as (1979: 122), claimed the importance of language education. Schools in Japan have come to emphasize language education, as the government curriculum guidelines require.

It is to be desired that education, not just language arts, includes the three activities detailed below, in addition to taking up narratives in texts.

First, creative expression activities by language for constructing possible worlds should be included. Language not only transmits but also creates or constitutes knowledge or "reality" (Bruner 1986: 132). Teachers have to teach both functions.

Second, reflection by language should be included, and Bruner (1986: 132) claimed the importance of it. It is achieved by the objectification of products as the externalization of the cognition in the expression activities.

Third, Bruner (1986: 127, 1996: 93) claimed the importance of dialogue frequently. Dialogue in the classroom will build school cultures that operate as mutual communities of learners all contributing to the process of educating one another (Bruner 1996: 81–2). It does not simply foster cognitive competence but also promotes the social side of learning related to the motivation to learn and social inclusion.

Studies in teaching and learning should examine the theory and practice of such expression activities by language.

5.7　Learning contextually and decontextually

Early his career, Bruner thought the very role of education was to teach abstract thinking. But he later came to realize that contextual learning was also important.

According to a review of cognitive science (Bransford et al. eds 2000), experts are good at retrieving the knowledge that is relevant to a particular task by "conditionalizing" knowledge, including a specification of the contexts in which it is useful. We must take into account the context in learning.

Studies in teaching and learning must investigate methods of contextual learning, taking effectiveness of decontextual learning into account.

A method is linking narratives to science, as previously described, because narratives shape our ways of experiencing the world (Bruner 2010: 45) and depend on context (Bruner 2010: 46).

Another method is contextual teaching and learning (CTL), practiced in schools of the United States. CTL integrates (contextual) technical and (decontextual) academic learning, and was developed by applying the findings of cognitive science and the learning sciences (Matsumoto 2009).

The use of enactive or iconic representation in teaching symbolic representation (Fyfe et al. 2014), previously described, is also a method of using contextual learning for decontextual learning.

5.8 The *activeness* of active learning

Learning "is best when it is participatory, proactive, communal, collaborative, and given over to constructing meanings rather than receiving them" (Bruner 1996: 84). This is the meaning of learning as an active process as Bruner claimed. We should understand *activeness* as such in active learning.

Bruner (1977: 48) described learning as three almost simultaneous processes: the acquisition of new information, transformation, and evaluation. Contemporary schools overemphasize the first; however, new information alone is insufficient for learning. Bruner indicated that we have to teach the skills of transformation and evaluation, namely, metacognition, in active learning.

Further, in Bruner's view of learning, active learning has to make the learners who try to understand everything from only one aspect (like as "half a word to a wise man is enough"). In so far as we adopt the image of such learners as an aim of school education, we can understand the importance of the spiral curricula or Bruner's (1979: 109) claim, "we opt for depth and continuity in our teaching, rather than coverage."

In promoting active learning, we must not only consider that learners go beyond the curricula (or the expectations of societies and school systems) but also expect so. Active learning requires us to take a paradox of the dialectic between acquiring and exceeding cultures. Although active learning may be a method of teaching more effectively the competence for which societies and school systems ask, it is unlikely to be a convenient way of teaching it.

5.9 The evaluation of learning outcomes

In active learning, we need to evaluate the extent to which the attitudes or skills of the learner exceed the culture, rather than the quantity or accuracy of the attitudes or skills s/he has acquired from the culture. That is because "no person is master of the whole culture; [...] To be whole, he must create his own version of the world, using that part of his cultural heritage he has made his own through education" (Bruner 1979: 116).

For example, Bruner (1967: 64) described the method of Lev Vygotsky, which examines how s/he copes with a problem when given the best hints, the best help, the best tools, and the best fulcrums or formulas.

It is difficult for teachers to develop such methods of evaluation by themselves. Bruner (1977: 68) claimed that a student who is more intelligent than his teacher may have developed intuitive ways of approaching problems that he cannot explain, and in such a case, it is impossible for the teacher to properly reward or correct such students. Studies in teaching and learning need to focus on such a method.

5.10　Cultivating teachers' folk pedagogy

Bruner stated, "in theorizing about the practice of education in the classroom [...], you had better take into account the folk theories that those engaged in teaching and learning already have" (1996: 46). Folk theories (i.e., folk psychology/pedagogy) play an important role in teaching and learning.

We have to provide teachers with some insight into their own folk theories that guide their teaching (Bruner 1996: 49). It is promising to use stories as case methods.

The author discusses Bruner's claim below by putting it into the framework of teaching mind (Matsumoto 2015) as the base of teachers' technical competence.

In the step of deliberation, teachers need to conjecture the cognitive process of the learners that they cannot examine directly. Namely, "explaining what children *do* is not enough; the new agenda is to determine what they *think* they are doing and what their reasons are for doing it" (Bruner 1996: 49).

In addition, it is important to reflect on the process of their practices for developing the technical competence of teachers. In the reflection process, it is beneficial for teachers to examine their own folk theories.

Studies in teaching and learning should study the features of folk theories that teachers have and the role and developing methods of their folk theories in cultivating their teaching mind.

5.11　The role of teachers

As described above, it is obvious that the role of teachers is not only their teaching knowledge. As Bruner (1977: 91) stated, teachers can still motivate the students and improve the quality of their learning by being a role model as an identification figure and an effective communicator, with the aim of developing such features as the students' intersubjectivity and belongingness to the culture.

Moreover, no educational reform can get off the ground without adults actively and honestly participating, especially teachers (Bruner 1996: 84). Teachers should grow through learning actively by themselves, to promote active learning as an educational reform (Matsumoto 2016b).

6　Conclusions

The current article reviewed Bruner's educational theory in reference to his life works to discuss its implications for studies in teaching and learning and active learning.

Throughout his life, Bruner studied the dialectic between the past/present and the possibilities in the interaction between human beings and cultures, and the duality of acquiring and creating in learning. On the basis of his studies, he formulated his pedagogical ideas. However, as Bruner deepened his extended view of learning and culture, he came to acknowledge the social side of learning, the significance of learning contextually, and the multiplicity of representation.

According to the findings of this article, the common view described in 1 is incorrect. That is because Bruner already studied the interaction between human beings and culture and regarded learning as a creative process to transcend culture through inheriting it in the 1960s, although his view of culture was extended in the 1970s. Bruner (2012b: 28) also acknowledged this.

This article also discussed his educational theory in reference to other findings in cognitive science. His claims correspond with the general findings in cognitive science literature. This is obvious because Bruner was a psychologist who studied empirically human cognition himself.

The author wrote the present article as if it was an original story based on Bruner's works. This story was created to clarify the implications of Bruner's works for studies in teaching and learning and active learning. The readers will evaluate the power of the story as a model of evolving studies in teaching and learning and active learning.

Aside from evaluation, considering the state of educational theory or practice in Japan, it is clear that Bruner's educational theory is neither understood sufficiently nor is it reflected in teaching practice in Japan. The current advances of cognitive science and active learning require us to learn from his educational theories, which would bring great honor to his life and work.

May his soul rest in peace.

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