

A Deductive Description Of Cultural Diversity Of “Observation” In Science Education

by

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SUMMARY

This paper presents an axiomatic form of “observation”; the form establishes an extremely abstract relation between words about the world and how to watch and understand it: In the sphere of [EXPERIMENT], [NATURE] is [OBSERVED]. An axiom or an axiomatic system consists as a rule of indefinable terms and terms which serve to state relations between these indefinable terms; the present indefinable terms are [EXPERIMENT], [NATURE] and [OBSERVED]. From this, cultural or linguistic diversity in science education is derived. The procedure is essentially similar to that in which Euclidean and non-Euclidean geometries are derived from the axiomatic system of geometry. Following the procedure, the present paper conducts a comparative study between the English term “to observe” and “kansatsu”, the Japanese equivalent of it. In Japan, science educators are inclined to regard that the difference between them stems from the Japanese traditional world view behind the scientific world view; this difference must be understood, for impartial studies, as the result of cultural diversity. Furthermore, if realizing it in a synchronic perspective, science educators can teach scientific concepts without suppressing their own Japanese world view, and can conduct their epistemological reflection at the same time. This strategy is the same as expected in foreign language education, and is generally applicable to science education in other non-Western nations.

Key words: Comparative Study, Axiomatization, Relativization of Science, Traditional World View

1. INTRODUCTION

As I argued from the viewpoint of structural linguistics (Kawasaki 1996), scientific thought is a thought cultivated according to nature-associated relations¹⁾ exclusively formed in SAE languages²⁾. English is typical of them and W-science³⁾ as a language is also classified into SAE. Suppose two words belong to different languages respectively. Since even the words referring to the same referent may recall different clouds of words independently, as pointed out in Kawasaki (1996), nature-associated relations are incommensurable with shizen-associated relations formed in Japanese, which is typical of non-SAE languages. The Japanese term “shizen” has been regarded as the Japanese equivalent of the English term “nature” only because a part of referents of this term coincide with those of “nature”. Thus, this Japanese term sometimes refers to referents which “supernatural” or “supernature”, an opposite of “nature”, refers to.

Structural linguistics also argues that a language, i.e., a system of words, creates a system of reality innate in the language. Every world stems from innate articulation in the specific language. In the innate articulation in the language, meanings are arranged and assigned to the corresponding system of objects; consequently, the world is formed and the world view is formulated. Since the specific language is articulated by its own viewpoint, “it is the viewpoint that creates the object” (Saussure 1966, 8). The difference in viewpoint leads to the cultural difference between Japanese system of reality and that of English; “nature” is incommensurable with “shizen”. I also investigated this incommensurability between them by considering the differences between nature- and shizen-associated relations (Kawasaki 1996).

There I also emphasized that science educators in the non-West, i.e., non-Western nations, must identify science education with foreign language education, because the way to consider the incommensurability is the same as expected in learning and studying foreign languages (Kawasaki 1996). If science educators agree with this opinion on science education, they have to focus their attention on the issue of translation from SAE languages into a non-SAE language. Distinguishing between synchronic and diachronic perspectives on cultures or languages, I discussed the issue of translation and formulated the procedure as axiomatization (Kawasaki 1997). Regarding two incommensurable systems in the diachronic perspective, on one hand, terms can be interpreted one by one without consideration of relations to which the terms are subject; for instance, Newtonian mass can be interpreted into Einsteinian mass as a mass depending on its velocity.

On the other hand, regarding two incommensurable systems in the synchronic perspective, an apparent similarity in relation between the systems might be found. For a correct translation, science educators must be aware that it is merely apparent (Kawasaki 1997). This is the critical issue of translation from one system to another. Since W-scientific concepts were translated into Japanese ones in science education, the incommensurability between them must be situated in the synchronic perspective. In Japan, however, science educators have overlooked this

incommensurability. Taking the incommensurability into consideration, science educators must not be deluded by the apparent similarity; however, the similarity provides a clue for the correct understanding of W-scientific concepts at the same time. Actually, this is the same as expected in foreign language education. Being conducted as foreign language education, science education could remind students of the cultural diversity regarding how to grasp the world or nature in the synchronic perspective.

However, science educators in Japan as well as in the non-West have a tendency to situate W-science and other world views in a diachronic perspective. The other world views are always classified into so called ethno-science. This tendency inevitably leads them to give W-science superiority over all ethno-sciences; they confidently expect to replace their own world views by W-science in their science lessons. They do not think that their world views demonstrate the synchronic diversity of how to grasp the world; actually, they are apt to consider their world views retarded. This is an issue of culture evolutionism rather than translation. This prejudice toward W-science completely obscures the necessity of synchronic relativization of W-science: impartial cross-cultural or comparative consideration in the synchronic perspective between W-science and non-Western world views. If science educators fail in the synchronic relativization of W-science in the non-West, their students might get confused about the cultural identity of the world view in their science education. Obviously, science education in the non-West must refrain from this.

In order to enlighten science educators on this problem, Kawasaki (1992) gave parallel descriptions of “kansatsu” and “observation”. However, these descriptions were not provided in a common comparative dimension which the present axiomatic form offers. In other words, while structural linguistics functioned as the reference frame of thought, the actual procedure for the comparison was rather implicitly assumed in the previous paper. Formulating the axiomatic form of “kansatsu” or “observation”, the present paper gives a full description of this actual procedure. Adding some new considerations to the previous ones in Kawasaki (1992), the present paper unifies those parallel descriptions by means of the axiomatic form of “kansatsu” or “observation”. Consequently, the present paper acquires greater applicability in cross-cultural considerations of science education

The next section will describe the axiomatic form of “observation”, and English and Japanese articulations of this form will be shown in the third section. Taking account of the difference in articulation between English and Japanese, the fourth section will clarify and investigate a typical process for Japanizing this concept from the present viewpoint of the axiomatic form. Since the English expression exposes cross-cultural problems different from those pointed out in the previous paper, this section will help to deepen an understanding of both “kansatsu” and “observation”. The final section will make some concluding remarks on science education from a cross-cultural point of view.

2. AXIOMATIC FORM OF “OBSERVATION”

In order to consider the cross-cultural problem stated above, I here present an extremely abstract relation between the world and how to watch and understand it; in other words, I establish a virtual situation where both “observation” and “nature” are not yet articulated or conceptualized. From the axiomatic form, it becomes possible to describe diversity of types of attitude toward the world in a synchronic perspective: a deductive description of cultural difference in attitude toward the world. The deductive description is feasible for science educators in the non-West to relativize W-science and reflect on their world views in the synchronic perspective. This description reveals a synchronic difference in how to watch and understand the world, i.e., the difference between the ways of “observation” and “kansatsu”. Observation of the world is always cultivated in such a way that the innate objects are properly watched and understood in the language concerned; conversely, the innate system of objects is so arranged that the innate activity “observation” or “kansatsu” can lead to correct understandings of them. The system of W-scientific reality is not an exception to the systems stated above. Therefore, it is clear that observation of the W-scientific world cannot be adopted in a different culture or language without adequate considerations.

As a rule, an axiom or an axiomatic system consists of indefinable terms and terms which serve to state relations between these indefinable terms. In the axiom, the indefinable terms are subordinated to the relations; then, Euclidean and non-Euclidean geometries are unified by the axiomatic system of geometry (Blanche 1973). In a similar way to the case of geometry, different cultural or linguistic attitudes toward the world can be unified. Since the indefinable terms have in effect no meanings, each of them can imply referents rather arbitrarily. This is why the axiomatic form can unify the cultural or linguistic different attitudes. In Kawasaki (1997), I presented the axiomatic form stating the relation between the two indefinable terms, [SCIENCE] and [NATURE] which are expressed in capital letters and bracketed in order to emphasize that they are indefinable. The axiomatic form of science presented in Kawasaki (1997) is as follows:

[SCIENCE] is a system of knowledge about [NATURE]. (A1)

Such forms like this are designated as “axiom” for simplicity. The indefinable term [SCIENCE] can be understood as a superordinate to all ethno-sciences as well as W-science; regardless of linguistic or cultural context, the term [NATURE] can refer to everything that “nature” and all other linguistic equivalents of “nature” refer to.

As Kawasaki (1997) discussed in detail, regardless of cultural context, the axiom (A1) can describe in the single form the different types of relationship between the world and the system

of knowledge obtained from it. When the axiom (A1) is considered in the context of Japanese culture, this states an innate relation in Japanese culture between “shizen” and Japanese science. Whoever takes the axiom (A1) into consideration can make a proper translation of the English term “nature” into the Japanese term “shizen”, rejecting the nomenclature view of language and having adequate consideration of the relation concerned (Kawasaki 1996). Naturally he/she is constantly aware of the incommensurability between them in translating it, because he/she is aware that this Japanese relation is a different articulation of the axiom (A1) from that of English. In this way, the axiom (A1) is helpful to science educators in giving cultural explanations of the incommensurability.

In addition to (A1), a new axiom of “observation” is presented; it consists of three indefinable terms, [EXPERIMENT], [NATURE] and [TO OBSERVE]. The relationship between them is as follows:

In the sphere of [EXPERIMENT], [NATURE] is [OBSERVED]. (A2)

In the following section, this axiom is considered in the contexts of English or W-science and Japanese, respectively.

3. ARTICULATION OF [OBSERVATION]

1. *In the Context of W-science*

When the axiom (A2) is considered in the context of W-science, the indefinable terms [EXPERIMENT], [NATURE] and [OBSERVED] are articulated as “experiment”, “nature” and “observed”, respectively: “In the sphere of experiment, nature is observed”. The terms “nature” and “to observe” have established an intrinsic subject-object relationship in the sphere of experiment in W-science. “Nature” i.e., nature as reality, has been so articulated that it constitutes characteristic features suitable for observation; conversely, the activity of observation has been so articulated that in this activity nature is properly observed.

As discussed in Kawasaki (1996), the term “nature” forms logos-associated relations under the predominant influence of Christianity, which regards “the Creator”, “word”, “mathematical description” and “human reason” as integrated into a single Greek word “logos”. In addition to Christianity, logos-associated relations were reflected in all physical science during the Middle Ages.

In Saint Augustine the Platonic ideas became ideas in mind of God, ideas in accordance with which He had created the world. In the Wisdom of Solomon (11: 20) one reads, “...Thou hast ordered all things by measure and number and weight”, a verse which during the Middle Ages was understood to be the basis of all physical science. But

measure and number and weight were mathematical ideas and since Neo-Platonism was highly colored with Pythagoreanism, it became almost a rule to identify the ideas in the mind of God with the mathematical ideas. (Boas 1973)

Clearly, modern physics succeeds to this world view.

The Platonic and Galilean image of a world logical and mathematical in structure, created by a “geometer God” who carried out the creation by number, weight, and measurement (*numero, pondere et mensura*), was undoubtedly to be more fertile for the development of modern physics than the Baconian image of Nature as a labyrinth..... (Rossi 1973)

This is why W-scientific descriptions must be mathematical.

Since W-science canonized this world view, W-science has been organized as follows: The use of human reason to make a mathematical description of nature that the Creator created by means of His word. More clearly, if the *logos*-associated relations in the above expression are replaced by the term “*logos*”, the foregoing is rewritten as follows: The use of human “*logos*” to make a mathematical description of nature that “*Logos*” created by means of His “*logos*”. Surely, this shows a self-evident truth in Christian faith, and formulates the Christianity frame of reference. Therefore, even at the present time, W-scientific thought is not essentially irrelevant to this frame of reference. Regardless of science educators’ and scientists’ personal religious faith, they continuously quote in their activities this Christianity frame of reference; however, they are usually unaware of their quoting it.

Within this Christianity frame of reference, Western intelligence has encouraged the interaction between “nature” and the activity “to observe”. From the viewpoint of associated relations, the terms “to objectify”, “to observe” and “observation” form ob-associated relations. The Oxford English Dictionary explains that the term “observe” consists of the prefix “ob” and the base “servare” as follows:

The prefix “ob” means “in the direction of”, “towards”, “against”, “in the way of”, “in front of”, “in view of” or “on account of”; the base of this term “servare” means “to watch”, “look at”, “guard” or “keep”.

The words forming ob-associated relations commonly imply the insulation of the one who observes from what is observed: the insulation of an observer from his/her object. The object which also belong to ob-associated relations can never be merely watched or looked at; it must be isolated from the observer for genuine observation. The awareness of one’s “subject” produces the concept “object” and vice versa. This is the innate subject-object relationship in W-science.

2. In the Context of Japanese

The term “shizen” stemmed from the Chinese term “*tzu jan*”, of which concept was originally formed according to Taoism in the former half of the 3rd century B. C.. This

Chinese concept reveals the state of spontaneity which stands for the highest virtue (Lau 1963, 82); as pointed out in Kawasaki (1990), the best approximation for this term can be seen in the essence of the following sentence: I am who I am (Exodus 3:14). However, there is a distinct difference between the state of spontaneity and this approximation: Chinese philosophy has never recognized a creator. Since Japanese culture accepted “tzu jan” as “shizen” about fifteen hundred years ago, the original Chinese concept has been Japanized. For instance, Shinran (親鸞), a Pure Land Buddhist in the 13th century, identified it even with supreme Buddha associated with the Bodhisattva “Kanzeon (觀世音, Goddess of Hearing)” (Horita 197, 530).

In the 18th century, the contributor of the preface to *Shizen Shin'ei-do* (自然真營道) written by Ando Shoeki (安藤昌益) explained the real significance of “shizen” as follows (Bito and Shimazaki 1977, 12):

According to the ancient wise men's understanding of “shizen”, although one can neither understand why “shizen” does so nor consider how it works, yet it is sure that everything comes out of “shizen”. Only after one becomes aware of one's total inability to perceive and understand “shizen”, becomes he/she able to accord with it. (translated by the present author from the Japanese original)

The foregoing states that human reason cannot understand about “shizen”, whereas “nature” can be understood according to logos-associated relations as discussed above. The activity of “kansatsu” has been so articulated that in this activity “shizen” is properly grasped.

4. THE PROCESS OF JAPANIZING

1. Japanization Based on Translation into Japanese

Although the overwhelming majority of science educators in Japan have considered “kansatsu” a precise equivalent of “to observe” or “observation”, Kunihiko Hashida (橋田邦彦)⁴⁾, Professor of Physiology at Tokyo Imperial University, was an exceptional and distinguished science educator who discriminated “kansatsu” from “observation”. By receiving powerful stimulation from Western civilization, he cultivated his philosophy of “kansatsu” in order to accord with “shizen”; it should be emphasized that he never cultivated the philosophy of “kansatsu” in accordance with “nature”. At first, he seemed to consider the difference in concept between the two terms in the synchronic perspective. However, he was rather reckless to compare them since he firmly believed that the world view must agree with the view of life (Hashida 1940, 3). Hashida, as a physiologist, had formed a world view according to W-science, but his view of life was in the context of Japanese culture. Regardless of their respective contexts, he claimed that “kansatsu” was superior to “observation” in watching and understanding the world, and that “kansatsu” ought to be a genuine W-scientific activity. On the basis of this superiority, he asserted the replacement of “observation” by “kansatsu”, and

introduced Japanese science, which he expected to be superior to W-science.

Since the term “superiority” or “inferiority” strongly implies a comparison between W-science and Japanese science in the diachronic perspective, he actually insisted that Japanese science was advanced in the activity “kansatsu”. By insisting on superiority, he seemed to cancel out the fact that Japanese science was totally behind W-science. Apart from his unreasonable insistence on superiority, his thought on “kansatsu” clearly shows Japanese an articulation of the axiom (A2). This term is so articulated that “shizen” is properly grasped in this activity. Although the W-scientific term “observation” had been translated into the Japanese term “kansatsu”, his intelligence, cultured on the basis of neo-Confucianism, did not overlook the genuine meaning of “kansatsu”, which typically characterizes the Bodhisattva Kanzeon in Buddhism. Therefore, an investigation of Hashida’s thought on “kansatsu” must stimulate science educators in Japan to reflect on what they subconsciously do in “kansatsu” of “shizen” which can be neither perceived nor understood. His thought is highly beneficial for science educators’ epistemological reflection in Japan on how the W-scientific concept “observation” has been accepted and Japanized.

As discussed in Kawasaki (1992), Hashida’s thought can be related to the name of the Bodhisattva “Kanzeon”, which has the same kanji-character “kan” (觀) as the term “kansatsu” has. Since kanji-characters are ideograms in the Japanese writing system, it is natural that terms including the same kanji-character forms a cloud of associated relations. Therefore, the name “Kanzeon” and the term “kansatsu” form kansatsu-associated relations.

The meaning of this bodhisattva’s name traditionally has been understood in several ways, emphasizing his sovereignty over the material world and his responsiveness to the calls of suffering humanity. A principal interpretation holds that the name Avalokitesvara is a compound of Sanskrit avalokita and isvara, translated variously as “the lord of what is seen, the lord who is seen” or “the lord who surveys, gazing lord”. The celebrated seventh-century Chinese monk-scholar Hsuantsang upheld this view, translating the bodhisattva’s name as Kuan-tzu-tsai (“gazing lord”). (Birnbau, 1987) Additionally, the two names are dedicated to this Bodhisattva, namely,

Kuan-yin: he who has perceived sound;

Kuan-shih-yin: he who perceives the sounds of the world or hearer of the sounds of the world. (Birnbau 1987)

In the foregoing the Chinese name “Kuan-shih-yin” is expressed by the same kanji-characters as “Kanzeon”. Therefore, the possible English equivalents of “kansatsu” are “to gaze”, “to perceive” and “to hear”; moreover, Nakamura (1993, 559) picks “to contemplate” as an English equivalent of “kansatsu”. The faithful have attributed the activity “kansatsu” to the bodhisattva “Kanzeon”; the faithful never envisage themselves being isolated and observed. In accordance with the Japanese subject-object relationship, “kansatsu” formulates the Japanese mode of relation between the world and how to grasp it.

In investigating physiology, Hashida asked himself “What is life?”; he thought that physiology could tell merely “How life lives” (Hashida 1936, 296). In order to find the answer to his own question “What is life?”, he returned to the philosophy of Dogen (道元), the great Zen master in the 13th century in Japan. Eventually, he concluded that “to observe” was not enough to carry out authentic W-science because objects were always separated from the observer in W-scientific observation. Deriving inspiration from the philosophy of Wang Yang-ming (王陽明) (1472-1528), the Chinese Confucianist of the Ming dynasty, Hashida called the true stance on observation “busshin-ichinyo (物心一如)”. In this intellectual situation “busshin-ichinyo”, an observer’s mind merges imperceptibly into his/her object at the ultimate stage of empathy with it (Hashida 1939, 50). This inspiration accords closely with the philosophy of Dogen, who idealized the intellectual situation to grasp the world without intervention. According to Boas (1973, 542), suppose that “knowledge is of two sorts: one immediate, sensory, direct grasping of that which is known, and the other mediated, ‘intellectual’, inferential”. Obviously, Dogen cultivated the former sort of knowledge, and W-science has cultivated the latter.

(Dogen) says “The real aspect is all things. All things are this aspect, this character, this body, this mind, this world.....” When one asserts “all things are the real aspect”, the predicate being of a larger denotation, the real aspect seems to contain something other than all things. But in the converse expression “the real aspect is all things”, the meaning is that there is nothing that is not exposed to us. (Nakamura 1993, 352)

As I revealed in Kawasaki (1999), the essence of Japanese world view is to consider the world to include nothing that is not exposed to us. In accordance with this world view, “kansatsu” has formulated the most suitable scheme for grasping this world. Consequently, Hashida rejected the Western subject-object relation as wrong and praised the Japanese subject-object relation in return.

However, Hashida’s thought on “kansatsu” added more confusion between Western and Japanese cultures because he insisted the Japanese subject-object relation in the context of either W-science or Japanese science rather arbitrarily. In the following, I have made a translation of his opinion on “kansatsu”. In the translation, it is intended that the Japanese term “kansatsu” be uncritically replaced by “to observe” or “observation”. Western readers may feel his opinion irrational or nonsensical and may be frustrated in trying to understand it.

With such a stance as this (busshin-ichinyo), observation should be carried out in the situation that an observer has deep empathy with his/her object; the observer and the object should be in perfect harmony with each other. And ultimately, they are expected intellectually to merge imperceptibly into each other. If we adopt this stance of busshin-ichinyo in W-science, our activity of observation will be identified exactly with the object in itself. Even though it might appear that we ourselves observe the object, only the activity of observation is carried out. Neither ourselves nor the object will

appear in genuine observation. When I observe an object, for example, the object is not observed by me; only the activity of observation is carried out in itself. (Hashida 1939, 29-30)

Even if Western readers feel themselves succeed in understanding something about “observation” in the foregoing, the understood solely depends on the context. Although it is generally true that words can gain their meanings from the context concerned, the present case radically differs for Western readers. In the process of understanding, they unwittingly follow the container-contents model structural linguistics completely refuses; the container-contents model is a view of language where a word is a container which can hold any meaning arbitrarily (Kawasaki 1996). Since the supposed meaning cannot be found within possible English meanings of “observation”, the Western readers have to empty the observe-container in the first place. If they do not empty it, the newly understood meaning of “observation” is obstructed by the observe-contents which have already filled the observe-container. This is the same linguistic situation where Western readers try to load the nature-container with the meanings of “shizen”, which usually refers to the meanings “supernatural” signifies.

The incompatibility the Western readers have just felt stems from the intentionally-overlooked the incommensurability in the translation of “kansatsu” into “observation”. Translating W-scientific concepts into Japanese, science educators followed a similar procedure to what the Western readers have experienced. The kansatsu-container is emptied on the basis of the container-contents model, which suppresses the fact that the kansatsu-container cannot be separated from the kansatsu-contents in Japanese. Although science educators might succeed in emptying the kansatsu-container and filling it with the observe-contents, the kansatsu-container is inevitably re-filled with the innate kansatsu-contents in accordance with what kansatsu-associated relations imply. Since the kansatsu-container had retrieved the intrinsic meanings under the authority of W-science, “kansatsu” was believed to be more significant than just “to observe”. Actually, the meaning of “kansatsu” has never changed; it is the meaning of “observation” that science education distorted in Japan. Here, the structural linguistics assertion “one cannot cut the front without cutting the back at the same time” should be emphasized. In this metaphor, language is compared with a sheet of paper: thought is the front and the sound the back (Saussure 1966, 113).

Since the Western subject-object relationship is rejected in Hashida’s Japanizing “observation”, Western readers have an unavoidable feeling of incompatibility in the philosophy of Hashida. The same incompatibility must be felt when Westerners encounter prohibited collocations such as “mortal God” or “irrational thought”. These examples violate the accord in logos-associated relations⁵⁾. Similarly, the meanings of “to observe” inevitably violate the accord in kansatsu-associated relations which are arranged to grasp “shizen” directly. “Shizen” is inappropriate to isolation because it is identified, for instance, with the supreme Buddha. This is why Hashida rejected the W-scientific subject-object relationship as insufficient and

claimed the superiority of “kansatsu” to “observation”.

2. “Observation” as “Gyo”

“Kansatsu” usually appears as “gyo (行)” in the Japanese belief system. Hashida emphasized this in *Gyo toshite no Kagaku*, Science as gyo, (Hashida 1939), which is fully representative of his thought on “kansatsu”. The term “gyo” shows a rather wide spectrum of meanings because it springs from several Sanskrit terms⁶; the possible English equivalents are “gait”, “practice” and “exercise” (Macdonell, 1924). In the present context, “gyo” means a practice, especially a repeated exercise or activity easily performed in an exact manner without trainees’ criticism or judgment. Through repeated exercises of this kind, “gyo” formulates how to enforce personality-formation discipline. It is the essence of this discipline that even admirable results from the exercise are less praised than the endeavor to obtain the results. Following this Buddhist opinion of the personality-formation discipline, Japanese have believed that this attitude toward the endeavor can promise great educative results. Then, the philosophy of “gyo” exerts a decisive influence on the Japanese mode of education in a subconscious dimension, a hidden curriculum.

Hashida emphasized these educative consequences more than the understanding of the world. His thought on “kansatsu” as “gyo” can be outlined as follows (Hashida 1939, 14-31):

Obviously, observation plays a significant role in science, and symbolizes scientific activities. The Western mode of observation, however, is insufficient to impose genuine discipline on a scientist because objects are separated from the scientist in observation. If the scientist is separated from his/her objects, he/she cannot grasp them in the real aspect of the objects. We should replace the insufficient activity “to observe” by “kansatsu”, the authentic mode of observation. “Gyo” is the discipline for conducting “kansatsu”. More definitely, only “kansatsu” conducted as “gyo” can dissolve the partition between the observer and the objects; in conducting “kansatsu”, the scientist can reach an ultimate stage of empathy with the objects. Furthermore, when “gyo” is achieved to a certain degree and when “kansatsu” is conducted genuinely, the one who carries out “kansatsu” and the objects of “kansatsu” will melt into only “kansatsu” as “gyo”, the activity in itself. This is the genuine subject-object relationship in science. (summarized and translated by the present author from the Japanese original)

Hashida’s subject-object relationship should not be regarded as similar to inevitable quantum-state disturbance evaluated in quantum mechanics. It is certain that an observation of a quantum necessarily disturbs its quantum states and that the relationship takes place between the observer and the quantum. However, the same observation brings the same statistical results regardless of the observer’s personality. In this sense quanta always remain objectified; moreover, the quanta cannot exert any influence upon the observer. Rather, they must obtain a certain influence of the object upon the observer in the subject-object relationship Hashida

asserted in the context of W-science.

In Japanizing “observation”, he unwittingly presupposed that it could be equated with “kansatsu” in the first place; in other words, the first step of his procedure was to introduce “kansatsu” as an equivalent of “to observe” into the W-scientific activities or science education in Japan under the authority of Western civilization. Then, he began to discriminate “kansatsu” from “to observe”; on the basis of the Japanese belief system, he attached or regained the traditional meanings of “kansatsu”, which was perfectly proper for grasping not “nature” but “shizen”. He insisted, demonstrating the superiority of “kansatsu” to “to observe”, that the philosophy of “kansatsu” would prove a remarkable contribution by the East to Western civilization through a change in subject-object relationship. This is representative of Japanizing Western concepts: Superiority of a Japanese concept to the corresponding Western one is asserted on the basis of Japanese culture. Such ethnocentrism as this might in a sense be a sound and natural response of the culture, but this ethnocentrism undoubtedly obstructs epistemological reflection.

Suppose he had paid sufficient attention to the axiom (A2). Being stimulated by the axiom, he would develop, in the synchronic perspective, some awareness of the distinction as discussed above. Understanding the difference of the Western world view, he would have recognized within the Christianity frame of reference that his question “What is life?” was self-evident and that only the question “How does it work?” was significant. Since life is an essential attribute of creatures according to Christianity, the what-question is worthless to Christianity. However, it is particularly significant to investigate the how-question because this investigation might answer the question “How did the mind of God work?”. Hashida could have discerned that the question “How does it work?” was significant to Western intelligence and that the question “What is life?” became significant only in Japanese context of culture. Hence, Hashida would not have enthusiastically praised “kansatsu” as a means to solve that what-question in W-scientific methodology. Discriminating “kansatsu” from “to observe”, he would have conducted his epistemological reflection on “kansatsu”. In conducting his epistemological reflection, he would have understood, in the synchronic perspective, what “kansatsu” and “to observe” signified, respectively. Consequently, he would not have insisted the superiority of “kansatsu” to “to observe”; he could have realized that the two terms merely showed only a synchronic diversity in patterns for watching, understanding and grasping the world articulated in the respective languages.

Throughout Hashida’s endeavors to integrate “kansatsu” as the W-scientific activity into the Japanese belief system, he was always conscious of his discriminating “kansatsu” from “to observe”; however, he took no notice of the fact that the two terms belonged to systems incommensurable with each other. Since he firmly believed in the universality of W-science, this universality guided his philosophy, which was destined to hold a strange and delicate balance between W-science and the philosophy of Dogen. In fact, Hashida failed to establish a

common dimension where he could have established an impartial comparison between “kansatsu” and “observation”; it is the axioms presented here that could prepare comparing dimensions of this kind. His solitary and unique endeavors were rather misdirected and might introduce more complication and confusion into the Japanese value system. Nevertheless, I regard it as particularly significant for science education that Hashida held his own stance on the distinction of “kansatsu” from “to observe”; anyway, he persistently strove to offer his own epistemological reflection on “kansatsu”. Hashida’s philosophy is the most intelligent response to the great impact of W-science in modernizing Japan. Actually, he was the first Japanese to succeed in relativizing W-science in the synchronic perspective to a certain degree.

Unfortunately, the science educators in Japan have excluded and almost forgotten Hashida’s philosophy, not because of any insignificance of his philosophy but because of studied neglect due to the unfair accusation that he was a war criminal of World War II. His philosophy has not received proper consideration after the war because it was thought as relevant to fanatic nationalism. However, it is not true that his philosophy was inspired by such fanatic nationalism as supposed (Shimizu 1982). If academic investigation is made into his philosophy without any prejudice, it will undoubtedly help science educators in Japan to relativize W-science in the synchronic perspective, and will reveal the tacit assumptions that the majority of the science educators made in order to accept W-science. This is the epistemological reflection on “kansatsu” that science educators have to conduct in Japan.

5. CONCLUDING REMARKS

The Collins COBUILD English Language Dictionary (1987)⁷⁾ gives the following explanation of “observer” as: “An observer is someone who spends time watching an activity or event in order to see what happens, but without actually taking part”. The phrase “without actually taking part” clearly defines the essential nature of observer’s attitude toward the object. The observer should be insulated from the activity or event that is watched. In order to conduct genuine observation, one should follow what observe-associated relations imply: The object should be set against the observer and isolated from the observer. If the observer is a Westerner, he/she can follow these procedures without being conscious of observe-associated relations. Non-Westerners, however, cannot be guided by observe-associated relations because they cannot assimilate observe-associated relations in their own languages. In Japanese language, for example, it is kansatsu-associated relations that establish the Japanese subject-object relationship.

Similar situations as experienced by Hashida may be found in non-Western nations when these nations attempt to transplant W-science. These nations readily accept the universality of W-science as a prerequisite for transplanting it; otherwise, these nations cannot transplant

W-science successfully. After accepting the universality, however, their indigenous non-Western languages, i.e., cultures, will naturalize each W-scientific concept in accordance with the associated relations formed around each equivalent in the non-Western language. This leads science educators in the non-West to a misunderstanding of W-scientific concepts as well as to forfeiture of their own cultures. Hence, in the non-West, science education must be identified with foreign language education.

Using the system of the axioms (A1) and (A2), science educators can realize the importance of the linguistic incommensurability in science education; consequently, they go on to attempt to conduct a cross-cultural study which is naturally situated in the synchronic perspective. When science educators succeed in identifying science education with foreign language education, they can give science lessons without suppressing their own non-Western cultures or languages. As discussed above, science educators or scientists have to quote the Christianity frame of reference for the W-scientific way of thinking regardless of the science educators' or scientists' personal faith. If adequate attention is paid to the present axiom of observation, students can obtain correct W-scientific concept "observation" from their science lessons in comparison with their traditional world views, and unnecessary confusion will not be introduced into their value system.

Notes

- 1) In a specific language, a pivotal word successively recalls a cloud of words in mind: the associated relations of this word. The associated relations of the word subconsciously guide an innate way of thinking about the word in the specific language. Since how to form such clouds solely depends on a structure of a language concerned, the innate way of thinking in the language or culture is characterized by how to form associated relations in the language (see Kawasaki 1996).
- 2) “Standard Average European” is abbreviated to “SAE”. Since among SAE languages there is a good measure by which these languages can in some way be calibrated (Whorf 1959, 214), languages classified in SAE can be regarded as united one. This makes it possible to articulate Western culture and to compare it with Japanese culture (see Kawasaki 1996). The present paper will refer to English as representative of SAE.
- 3) “W-science” is an abbreviation for “Western ethnoscience” which refers to “Western modern science”; see Kawasaki (1996) for detailed explanation of this term.
- 4) According to Sugi (1970), Professor Knihiko Hashida was born in 1882, a son of samurai lineage, and died in 1945. From 1914 to 1919, he went to Germany and Switzerland to study physiology. After coming back to Tokyo Imperial University, he gave a course in physiology and began to study *Shobogenzo* (正法眼蔵), Dogen’s Essentials of the True Law. He was also appointed Minister at Monbusho, the Ministry of Education, Science and Culture, in 1940 and retired in 1943. He committed suicide by poison just after World War II; unfairly, he was accused of being a war criminal for the reason that he had been appointed, at the outbreak of the War, Minister of Monbusho (translated and summarized from the Japanese original). Until junior high school, he was educated not only in Western Civilization but also in Chinese classics, namely Confucianism and neo-Confucianism. Neo-Confucianism, in particular, cultivated the samurai virtue and spirit through the Tokugawa period (1603-1868). Since neo-Confucianism shows a Buddhist influence, it is understandable that he focused his attention on the philosophy of Dogen.
- 5) According to the usage of technical terms of structural linguistics, these combinations are prohibited only in the dimension of *langue*, language as the norm. However, in the dimension of *parole*, i.e., speaking, these combinations are possible and can produce considerable effects in some context. Any combination might be possible in the dimension of *parole*. The present article is restricted mainly to the dimension of *langue* because the issues of education should be raised in the dimension of *langue* as the social norm.
- 6) Bukkyo Jiten (Nakamura 1989) gives the following Sanskrit terms as the originals of the Japanese term “gyo”: gamana, carita, carya, pratpatti, bhavana, anuyoga, samskara, samskrta.

- 7) Although the phrase “without actually taking part” is not emphasized in the new version published in 1995, this seems to the present author a very good explanation of “observer”.

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