

# Japanese Logical Thinking

## A Quantitative Assessment of University Students' Reasoning Abilities<sup>1</sup>

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*'When the wind blows, it becomes dusty;  
If it becomes dusty, it becomes injurious to the eyes;  
If it becomes injurious to the eyes, many people become blind  
and then, there appear many samisen (string instrument) players;  
If there appear many samisen players, samisens are in great demand;  
If samisens are in great demand, cats are killed (to make the bodies  
for this musical instrument); If cats are killed, rats increase in number;  
If rats increase in number, boxes are in great demand;  
Therefore, when the wind blows, box-makers become prosperous'<sup>2</sup>*

### **Summary**

*According to some experts, the thinking of most Japanese tends to be intuitive and emotional rather than logical; as it is apparently shown by the structure and use of the Japanese language that gives more preponderance to social nuances than to logical exactness. Besides this cultural bias, experts describe the educational system in Japan as one that promotes rote memory learning rather than the development of the students' reasoning abilities. Under this context, this paper explores two questions: First, are Japanese students at clear cultural disadvantage in developing their logical reasoning when compared to students in other cultures?. Second, to what extent does university schooling in Japan foster the development of students' logical reasoning?. To answer them, a sample of Japanese university students took a test on reasoning abilities. The results show that they perform much higher than Mexican students, and probably higher than American students too. However, fourth and first year Japanese students have statistically the same scores. Therefore, the main conclusion is that, although Japanese are not handicapped by their language to have good reasoning skills, four years of university schooling do not seem to improve the students' reasoning abilities.*

### **Introduction**

Today our sense of belonging to one world is stronger than ever; we live in the era of global economies, worldwide communications, efficient transportation and highly developed technologies which are, all together, rapidly closing the cultural gaps among the nations of the world. Yet, while it is evident that people's ways of thinking and living are continually affected by international events, it is also true that the national cultural framework in which people live still has a great influence on their mentality and behavior.

In a sense, individuals are "imprinted" from an early age by the particular cultural experiences of their own society. These first learning experiences build up through the years a predisposition for people to think and behave in a consistent and predictable way in the various scenarios of daily life; it is as if everyone carried "mental

maps” to know how to use and regard language, actions, time, space, relationships, work and leisure.

For instance, some scholars have pointed out the Japanese predisposition for beauty and social harmony and the respect for order, self-discipline and hard work; other authors have mentioned the Japanese appreciation for their good standing in the different social groups to which they belong and their tendency for making decisions by consensus, as well as for believing that a person is what he does, not what he intends to do. These and other similar characteristics have become “standards truths” for describing the Japanese way of thinking and living.

However, as useful as generalizations can be, one must be careful with the kind of statements that try to generalize cultural tendencies of any given nation; sociological descriptions are frequently like photographs that might show very well how a given society is or was, but that does not necessarily mean that it will remain unchanged in the future. It is clear that societies change because different ages demand different traits of both nations and individuals and past good generalizations can become present cliches that people repeat as if they were facts.

This paper is concerned with some of the generalizations about Japanese logical reasoning abilities stated by several authors, especially by H. Nakamura, an internationally recognized Japanese scholar. One of these generalizations claims that: “The thinking of most Japanese tends to be intuitive and emotional (and consequently), there is a tendency to neglect logical rules and logical coherence as well as to avoid complex ideas”. Even stronger statement is made by D. Richie who says that “logic, ronri, ronriteki, still remains one of the dirtiest words in the (Japanese) language”.

As the above generalizations are interesting from an educational point of view, this paper presents the results of an small sample of Japanese university students’ logical reasoning abilities in order to provide additional information to support or to question the validity of the general statements about the apparent deficiencies of Japanese’ logical reasoning. The interest in studying the postulated socio-cultural bias against logical thinking and the role of schooling in fostering the development of the students’ logical reasoning abilities should be understood in the context of the relatively recent worldwide movement of educators to foster Critical Thinking in schools and universities.

For the proponents of this movement, it is a fact that some societies, like Japan, are already in the post-industrial stage of development, which is characterized by a large production of information in every field of knowledge. This makes it virtually impossible for anyone to acquire all necessary information while in schools or colleges, as was supposed to be the case many years ago. As a result, in our times, people need to know how to think critically in order to make the best use of the information they have available.

If critical thinking, which depends basically on the force of good logical reasoning, should be the main purpose of education in the post-industrial society, several interesting questions arise in relation to the younger generations of Japanese. For instance, is the generalization about the neglect of logical rules and lack of logical coherence a cliché that still applies to the new generations of Japanese students? Are Japanese students at a clear socio-cultural disadvantage compared to students in other cultures in developing their logical reasoning abilities in the universities? And in the same line, to what extent does university schooling in Japan foster the development of students’ logical reasoning? This paper will try to answer these questions with the purpose of contributing to better understand the role of Japanese higher education in developing students’ logical reasoning skills.

## 1. 0. The Theoretical Framework

The line of the argument in this section will be as follows: It will be assumed that the capacity to reason logically is a universal human endowment that has a well-founded neuro-physiological and anatomical basis. In other words, there is no postulation of special innate thinking characteristics due to racial factors. Therefore, the

differences (if any) in the ability of individuals as well as of societies to reason logically is due basically to cultural factors, of which, language is preponderant. And, as individuals and societies change over time, new factors, such as new forms of schooling, may foster or not the development of logical reasoning. Indeed, to say it in computer jargon: human “hardware” is the same everywhere, what might change is the cultural “software”.

## 1. 1. The Neuro-Physiological Basis of Thinking

### 1. 1. 1. The Left and Right Hemispheres of the Brain.

For the last decades, our understanding of the mind has been profoundly affected by several disciplines, from philosophy to artificial intelligence, but discoveries in the physiology of the brain have shown that thinking has a physiological and anatomical basis as well as a psychological and sociological one. For instance, due to the now classic experiments of R. Sperry, J. Bogen and M. Gazzaniga (Sperry, 1964; Gazzaniga, 1967) the highly-specialized function of the two brain hemispheres is widely known. Evidence shows that in the 95 percent of the population, who are right handed, the two hemispheres process information in contrasting modes: The left hemisphere controls the development of language and logical thinking while the right hemisphere is responsible for the development of non-verbal language and intuitive thinking.

Another relevant finding is that hemisphere specialization appears to be unique to mature humans. Because of this, most investigators have attributed hemispheric specialization to human language acquisition, among other cultural factors.

### 1. 1. 2. The Cultural Basis of Thinking: the Language

Indeed, the relationship between thinking and language is very close. There seems to be a correspondence between the two. And if language is not thinking, it is certainly the expression of thinking; that is, a representation in sound, writing or gesture of the concepts produced in the operation of thinking (Lipman, 1991).

The relationship between thinking and language is of a reciprocal nature. The minds of people contain forms of linguistic expression, norms to order the operations of thought in such a way as to process information into patterns and be able to reach certain conclusions. At the same time, the forms of developing the grammar and syntax of a given language express the more conscious ways of thinking of the people using that language, and what is more, may be said to be one of the ways to explicate such ways of thinking.

Given that the mental processes of inference and judgment are the basic expressions of the operations of thinking, there are clear benefits to examining the ways of people’s thinking by analyzing the forms of expression in these two mental processes.

Furthermore, inference and judgment being in the domain of logic, it follows that logical reasoning is one important key for the study of the characteristics of people’s thinking. Of course, the use of formal logic is almost non-existent as a way of expression for most of the people in a given society. However, the features of the ways of thinking which are embodied in language may possibly become explicit in logic and may, moreover, be displayed in a systematized, organized state. And this is precisely where Nakamura starts his analysis about the ways of thinking of Japanese people.

## 1. 2. The Japanese Way of Thinking

### 1. 2. 1. Japanese Thinking is Intuitive and Emotional

According to Nakamura “The forms of expression of the Japanese language are more oriented to sensitive and emotive nuances than directed toward logical exactness” and this characteristic of the Japanese language corresponds almost perfectly with the strong tendency of Japanese people “to give special attention to those subjective and social relations and actions which form the basis of mutual understanding and loyalties to the family, clan, and nation” (Nakamura, 1964). In other words, according to Nakamura, given the great importance that

the Japanese have historically attached to the rules of propriety in human relations, their language has developed along intuitive and emotional lines rather than logical ones.

In addition to Nakamura, several other authors have also pointed out the intuitive and emotional characteristics of the Japanese language. For instance, F. Gibney, a leading expert in Japanese studies, says: "Japanese, with its many grades of polite and familiar expressions, is such a personal, indeed, intimate language that when foreigners begin to master it, they seem very intrusive to the Japanese subconscious" (Gibney, 1982).

#### 1. 2. 2. The Tendency to Neglect Logical Rules in the Japanese Language

In order to understand the following comments, we need to keep in mind that from the point of view of linguistic structure, the Japanese language is not related to any modern language except Korean, and when Japanese and English are compared they are like polar opposites. English is rich in classifications and distinctions and is more logically structured. Japanese, on the other hand, does not care much about these elements of language structure. As Gibney's puts it: "(In Japanese language) words are thrown into the conversation in a seemingly heedless confusion of nominative, predicates, and modifiers. Japanese gives far less consideration than most developed languages to syntactical or logical distinctions, as the Western mind understand them" (Gibney, 1982).

Nakamura concurs stating that: "The Japanese language does not tend to express precisely and accurately the various modes of being, but is satisfied merely with vague, typological expressions" (Nakamura, 1964 p. 531). For instance, there is not always a clear syntactic distinction between singular and plural, nor there is a distinction between genders, and no articles are used. For verbs, also, there are no distinctions of person and number.

But, we should not ignore that the Japanese language has clear distinctions in counting. For example, when one counts people, "ninn" is added to the end of the number as indication for people, while for objects, "ko" is added. Japanese language has more than ten postpositions for counting. Besides, though the system of honorific is apparently complicated and emotional, it has very logical structure according to the relation of speaker and listener. In some features, Japanese language is more articulated and structured than Western languages. This fact tells us that when we think of Japanese language, we might have to think its own way of articulation, not put our way of thinking on.

In fact, in spite of all the complications of the Japanese language, both Nakamura and Gibney states that "it is possible to express one's self as clearly in Japanese as in any other language, if one has the disposition as well as the logical clarity and habits of thought to do so. (But) we must not forget the important conditioning of ways of thinking by the cultural customs ingrained in the habits of people, and according to one school of thought, such customs are more important than the temporal limitations of the language in which they are expressed. ..we must admit the working of many influences that have brought it about that the aesthetic aspects of Japanese life and thought are far more dominant than any concern for exact logical modes of expression" (Nakamura, 1964, p. 543).

#### 1. 2. 3. The Apparent Lack of Logical Coherence

In addition to the analysis of grammar and syntax of language as a methodological instrument to understand the Japanese ways of thinking, Nakamura also analyzes the particularities of the introduction of Buddhism and Confucianism in Japan. From this perspective, he finds evidence of a certain tendency for Japanese arguments to lack logical consistency. Of course, every society in the world has its share of logical inconsistency in the various ways of thinking and living of its people, but when Japanese thinking is compared with the Western logical framework the differences are noticeable.

For instance, when Dogen, who has been considered as the pioneer of Japanese Zen philosophy, refers to the problem of life and death, he says: "Life and death matter little because the Buddha exists therein. And one is not perplexed by life and death because the Buddha does not exist there in" In other words, two formally

contradictory statements about the existence of Buddha are used as having the same meaning.

#### 1. 2. 4. The Tendency to Avoid Complex Ideas

The introduction of Buddhism in Japan is a very rich source for Nakamura to illustrate the Japanese's ways of thinking. For instance, he finds many examples that show the tendency of the Japanese to avoid complex and abstract ideas. One of the examples is the practice of Nembutsu (Keeping the Buddha in mind) by the Japanese which is completely different from the Nembutsu practiced by the Indians. While the Indian practice involves recalling the sublime complex features of Buddha, the Japanese form is just a simple instruction to invoke the name of Amitabha. For Honen, a Buddhist Japanese priest, people did not have to think about any doctrine or body of knowledge but only to invoke the name of Amitabha 'seventy thousand times a day'. "Renounce the spirit of self-relying disciplines; shut the gate of silent meditation and cultivation of virtues; ignore all of the devices; throw away all knowledge; and concentrate on the one discipline of invocation of the Buddha" (Idem, p. 559).

Along the same line, the Nichirenn sect doesn't regards the reading of the Hokke Sutra indispensable for salvation, while this scripture is considered very important. Nichirenn recommended the invocation of the compound word *Myo-ho-ren-ge-kyo*. "... you should consider that the reading of the whole eight volumes, or one volume, or one chapter, or one hymn, or one sentence can have no more value than the reading of one heading; *Myo-ho-ren-ge-kyo*."

In the next part of this section, some comments will be made in relation to the Japanese educational system and the extent that it may foster or not the development of logical thinking of Japanese students.

#### 1. 3. The Japanese Educational System and Students' Thinking Abilities

As with the Japanese economy, the wondrous growth of the Japanese educational system has brought with it problems not reflected in the reassuring statistics of worldwide academic performance.

First of all, the major pedagogical paradigm of Japanese educational system still assumes that the main purpose of education is for the students to absorb as much information in each discipline as possible and to do this by rote memory. "Learning by rote memory, mastering the form through imitation and repetition is the way of the school. (And) The same approach characterizes learning everywhere in Japan" (Condon, J. Kurata, K. 1983). Indeed, according to the etymology, the Japanese vocabulary "manabi" (learning) is derived from "manebi" (imitation).

For J. Dewey this is the classical categorical mistake of traditional educators; "to confuse the refined, finished end products of scientific inquiry with the raw, crude subject of scientific inquiry itself and try to get students to learn the solutions rather than investigate the problems and engage in inquiry for themselves" (Cited by Lipman, 1991). By asking students to memorize the end results of what the scientists have discovered and by neglecting the process of exploring the problems at first hand, no interest or motivation is engendered for real learning; that is, learning for meaning and thinking.

Secondly, the typical classroom setting, in most of the Japanese schools of the different educational levels, is one in which the teacher plays an authoritative role. As a result, the role of the student is passive, most of the time to be a listener. "The good student displays modesty, humility, persistence and forbearance. In a group setting, if the student thinks the teacher is less than fascinating, he may doze discreetly; if he finds the teacher less than outstanding, he conceals it. He may not challenge the teacher's wisdom" (Condon, J. Kurata, K. 1983). This situation certainly goes against the modern pedagogical models of students' participation in their own learning, that promotes students' thinking, proposed by J. Piaget, S. Vygotski, M. Lipman and many others contemporary educators.

In this new model, "students build on one another's ideas, challenge one another to supply reasons for otherwise unsupported opinions, assist each other in drawing inferences from what has been said, and seek to identify

one another's assumptions. It is a group dialog that tries to conform to logic and moves forward indirectly like the process of thinking itself" (Lipman, 1991 p. 15). But little of this seems to be present in Japanese schools, not even at university levels in which students are supposed to have reached their highest level of cognitive maturation.

But perhaps the most distinguishing characteristic of the Japanese education is the way the merit system is faithfully observed. Indeed, the Japanese students' performance on entrance exams based on rote memorization seems to be the main criterion to determine their future role in society. "Schools determine so much in Japan.: friendship, employment, marriage, all that shapes a life" (Condon, J. Kurata, K. 1983). And students really become highly efficient when confronting such examinations; there are reports of high schools which are famous because they spend the whole three years preparing students for university entrance examinations, and if students fail the exam, many of them spend one or two more years practicing with similar tests in order to increase their chances in a second or third time.

But once a person has arrived in the university, standards of academic performance are, to put it mildly, lax. According to some university students, it is almost impossible to fail a course even if they do not attend classes regularly. The interest in teaching and learning in the school suddenly disappears. "For the most part, Japanese university students are taught, if they care to learn, in large, uninspiring lecture courses. Almost 15 per cent of university classes have five hundred or more students in them. At the major public universities which, on the average, can spend three times as much per student as private institutions, there may be seminars and some tutorial instruction. But they are exceptions, not the general rule" (Gibney, 1982). Of course, now a days this notorious tradition are challenged. Many research and practices are done in order to improve the class situation. However, no fundamental reform has been implemented yet.

In short, Japanese schools and universities do not seem to be the best places to promote students' thinking abilities neither from the pedagogical point of view nor from the way they are structured.

#### 1. 4. The Research Hypotheses

Based on the theoretical context developed above and keeping in mind the research questions stated at the beginning of this paper, the following hypotheses will be explored:

If Japanese people in general and Japanese university students in particular, are theoretically handicapped by their language and other cultural factors, in the development of logical reasoning abilities then they could be expected to achieve lower scores in a Test on Logical Reasoning than university students in Mexico, a Spanish speaking-nation.

And by the same token, if Japanese students are released from the pressure of hard study when they enter university, higher education might have a negative effect on the improvement of their reasoning abilities.

#### 2. 0. The Methodology

The methodology to test the research hypotheses is empirical. That is, once a population is defined, a sample is taken from that population and data about students' reasoning abilities are collected via a standardized instrument. The data are statistically analyzed and conclusions are drawn from the results. As straightforward as it might seem, this approach makes at least the following assumptions: a) The population is well-defined, b) the sample is representative of that population, and c) the instrument used to collect the data is valid and reliable. In this section, the limitations encountered to meeting these requirements will be described. It is important to note that this methodological approach was selected in order to make the proper comparisons with a similar study carried out with a Mexican sample of university students.

## 2. 1. The Population

For the purpose of this study, the expression "Japanese university students" refers to the students enrolled in the first and fourth year of the Faculty of Education of one of the most prestigious universities in Japan during the academic year of 1996-1997.

## 2. 2. The Sample

From the above population, a sample of two groups of students was taken, one in the first year and the other in the fourth. This sample was not randomly taken because only two professors were willing to cooperate.

The group from the first grade had 55 students and the group from the fourth year had 30 students. All students were tested, but for the purpose of equal comparison, 30 out of the 55 students of the first year were randomly selected.

The whole sample had 18 male students 11 in first year and 7 in the fourth, and 42 female students, 19 in the first and 23 in the fourth year. The average age of the first year students was 18.97 and the average age of the fourth year was 21.77.

The mean scores in the University Entrance Exam (Common Test) were 718.73 points for the first year students and 691.04 for the fourth year students, both out of a maximum score of 800 points. It is clear that given the high prestige of this university, both groups of students most probably belong to the highest academic achievers of the university student population in Japan.

## 2. 3. The Instrument

The New Jersey Test of Reasoning used in this project was developed by the Institute for the Advancement of Philosophy for Children in conjunction with the Educational Testing Service. The test has been widely analyzed for validity and reliability in both the United States and in Mexico. The correlation with other reasoning tests is higher than  $r = .80$ . It is important to observe that this is a multiple choice test with three possible options. Therefore, the probability of answering correctly at random is  $P = .33$ .

The Japanese version of the Test was elaborated by two Japanese professors, first in Mexico and then in Japan. A pilot test was performed with a group of 20 students of the same Japanese university and corrections were made to elaborate the final version.

## 3. 0. Analysis of Results

This section presents the results in direct correspondence with the formulated hypotheses. It should be noted, that in this analysis, the mean score of the Mexican students is calculated from the means of students in three different universities, namely: A private university with high academic reputation, a private university with good academic reputation and a public university with bad academic reputation. Also the Mexican student sample comes from three different faculties: Engineering, Social Sciences and Business Administration. In each faculty there were 20 students in first year and 20 in the fourth year for a total of 120 students.

### 3. 1. The first Hypothesis.

For the first hypothesis the results show that the Japanese Mean Score is 44.17 while the Mexican Mean Score is 32.16 points out of 50. That is, the average percentage right for the Japanese students is 88.34 while the average percentage right for the Mexicans is 63.90.

Table 1. Mean Score of Reasoning Abilities of Japanese and Mexican University Students

	Japanese Students	Mexican Students
Mean	44.17	32.16
SD	2.73	3.10

As usual, in order to test the hypothesis, the question is not whether the two sample means are different but whether the two population means from which these samples are drawn are statistically different. To test this hypothesis a Two-Independent Sample t-test is calculated. The resulting calculation gives a  $t=20.41$  that has a level of significance of  $P=.001$ , well beyond the usual probability in social sciences of  $P=.05$ .

However given that the sign of the t-test is positive instead of the expected negative sign., the conclusion is that most probably, Japanese students have higher scores in the Test of Logical Reasoning than Mexican students. This result holds when comparisons are made between the mean of the Japanese sample (44.17) and the mean of Mexican students belonging to the Mexican university with the highest academic reputation (34.44).

The same result is obtained if the Japanese and the Mexican with high academic reputation samples are broken down by grade: The Japanese in First year scored 44.53 against the Mexican First year of 32.23 points. And the Japanese Fourth year score of 43.80 against the Mexican Fourth year score of 36.65 points.

Although detailed information about a similar study conducted in the US is not readily available, the reported mean score of 845 freshmen in nine colleges (one a community college) is 38.22; that is, the average percentage right is 76.44 (Lipman, 1991), almost 12 per cent lower than the Japanese score.

### 3. 2. The Second Hypothesis

The second hypothesis states negative university effects on the development of the Japanese students' reasoning abilities. The results are shown in Table 2.

Table 2. Means Score of Reasoning Abilities of Japanese University Students by Grade

	First Yeas (N=30)	Fourth Year (N=30)	Total (N=60)
Mean	44.53	43.80	44.17
SD	2.53	2.91	2.73

The average percentage of right answers for the first year is 89.06 while the average percentage right for the fourth year is 87.60. From the results, it can be seen that, as expected, the mean score of the fourth-year students is lower than the mean score of the first-year students.

Table 3. t-Test for Mean Score of reasoning Abilities by Grade

Variiances	t-value	df	2-tail Sig.	SE of Diff.	95% CI for Diff
	1.04	58	.301	.703	(- .674, 2.141)

However, according to the t-test estimates, the difference between the mean scores of Japanese students in both years is not statistically significant, since the probability of obtaining these means is  $P=.301$ . Therefore,

the null hypothesis cannot be rejected; the mean scores on reasoning abilities for both groups are statistically the same.

How do these results compare with the Mexican study? As stated above, the Mexican study included three universities with different levels of academic prestige. The results were as follows:

*Table 4.* Mean Score of Reasoning Abilities of Mexican Students (by Levels of Academic Prestige)

Academic Prestige	Year	Mean	difference
High	1 <sup>st</sup>	32.23	t = 4.42 (p < .05)
	4 <sup>th</sup>	36.65	
Good	1 <sup>st</sup>	31.87	t = 3.25 (p < .05)
	4 <sup>th</sup>	35.12	
Regular/Bad	1 <sup>st</sup>	28.32	t = .46 (n.s.)
	4 <sup>th</sup>	28.73	

The results show that the Fourth year students from the two good prestigious universities have a mean score higher than the First year students and the differences are statistically significant. While the Fourth year students from the less prestigious university show a mean score which is basically the same as the mean score of the First year students.

In other words, the better universities in Mexico do have a positive effect on the students' reasoning abilities while it seems that the bad prestige university does not. The latter result is similar to the one found in the Japanese case.

#### 4. 0. Conclusions

This paper was concerned with some generalizations about the lack of logical reasoning abilities of Japanese in general and Japanese university students in particular. Although nobody would claim that they are intrinsically incapable of logical thinking, some authors have stated that because Japanese historically have provided a great propensity to social nexus, their language has developed along the lines of intuitive and emotional thinking instead of logical reasoning.

Therefore, this study stated the hypothesis that, if Japanese are handicapped by their language in developing logical reasoning abilities, Japanese university students would have lower scores in a Test on Logical Reasoning than university students in other countries, like Mexico. This hypothesis is also reasonable if we take into account that the Instrument is verbally oriented and was elaborated from the Western point of view on what is good logical reasoning.

However the evidence gathered in this study showed that Japanese university students have statistically significant higher scores in the Test of Logical Reasoning than Mexican university students and most probably, than American university students too. Therefore the first conclusion is that, at least for the small sample of Japanese university students analyzed, the generalization does not apply and the stated hypothesis has to be rejected. Japanese university students seem as capable of good logical reasoning as any other group of university students in other countries, as long as the Test is well translated into Japanese language.

The question of a good translation of a any Test written in a foreign language is always important, but it seems even more important in the case of Japanese, given the particularities of the language mentioned before.

The Japanese language might have historically developed along the lines of intuitive and emotional thinking, as stated by the experts, but it seems that if written properly, Japanese people have also developed the ability to make good logical sense out of their language. To say it in words of a teacher of Japanese language: "Our language probably has no more than 80 percent of logical sense, but we have learned to make up for what is left".

Even if someone would argue that the Test used in this study was suitable for Japanese students because of their high efficiency at answering multiple choice tests, the probability of answering correctly at random is 33 percent. The 88 average percent of right answers obtained, seems too high to be attributed simply to raw efficiency in confronting similar tests.

However, we have to be careful to generalize the result of the test. It is true that Japanese students show that they have good logical thinking, but this doesn't always mean that Japanese can develop logical thinking with their intuitive language. For, it is well known that Japanese language has much more discrepancy between speaking and writing, when compared with Western language. Students are trained in school to read and write logically the written language, while their everyday speaking language sometimes remains less logical. It is plausible that students used their ability in written language in this test situation. In short, they have an another strategy for answering this kind of test without using their everyday language. Further research is expected to make clear this point.

The second conclusion of this study is that four years of university education in Japan seems to affect neither positively nor negatively the students reasoning abilities performance<sup>3</sup>. This conclusion is comparable to the case of the Mexican public university with bad academic reputation. In effect, the similarities between the Japanese and the Mexican public university are striking: a large student population in the classrooms, emphasis on research rather than on teaching and learning, and lax disciplinary policies concerning students' attendance and academic performance.

The argument, stated by some psychologist of the past, that people's reasoning abilities have completely developed by the age of 18 is not supported by the data obtained from students attending universities with good academic reputation. As it was shown before, the higher the reputation of educational quality the greater the students gain in their score on logical reasoning.

Both conclusions are important under the present debate for change in Japanese Universities: if Japanese society is going to meet the challenges of the postindustrial era in which they already live, universities have to better balance their two main basic functions: teaching and research. And teaching has to foster better students' reasoning skills than what it is doing now.

- 1 This research project was developed at the Research Center for Higher Education of Kyoto University during 1997 under the Fellowship Grant by Japanese Foundation. The content is author's responsibility.
- 2 "On the Tokaido Road; a Humorous Travel Diary" by Jippensha-Ikkū, Nippon Meicho Zenshu, XXII. Cited by H. Nakamura in "Ways of Thinking of Eastern People" pp. 534-5, University of Hawaii Press, 1964.
3. One might explain the null effect of Japanese University by the ceiling effect: that is, that there is no room for getting higher score because the score is already too high. But in fact, however, there is enough room for getting better score (more than 10 percent): Therefore, it seems unreasonable to attribute the null effect to the ceiling effect.

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