Atom Matching and the Interpretation of a Classifier[1]

Hironobu HOSOI

1. Introduction

This paper discusses two types of constructions in Japanese in which a numeral quantifier (NQ) appears adjacent to the host noun as shown in (1a) to (2b). In (1a) and (2a), the NQ appears in the prenominal position of the host noun, whereas in (1b) and (2b) it appears in the postnominal position. I will call the constructions in (1a) and (2a) PreN-Q construction, and the constructions in (1b) and (2b) PostN-Q construction:

(1a) Taro-ga **san-bon-no** **tenisu raketto-o** otta. (PreN-Q)
NOM 3-CL-GEN tennis racket-ACC broke
"Taro broke three tennis rackets."

(1b) Taro-ga **tenisu raketto** **san-bon-o** otta. (PostN-Q)
NOM tennis racket 3-CL-ACC broke
"Taro broke three tennis rackets."

(2a) Taro-ga **jyu-dan-no** **kaidan-o** nobotta. (PreN-Q)
NOM 10-CL-GEN stairway-ACC climbed
"Taro climbed the stairway of ten steps."

(2b) Taro-ga **kaidan** **jyu-dan-o** nobotta. (PostN-Q)
NOM stairway 10-CL-ACC climbed
"Taro climbed up ten steps of the stairway."

Kobuchi-Philip (2003) argues that the NQs have the same semantic interpretation between (1a) and (1b).

However, as discussed by Kato (2006), when the NQ does not quantify over the atomic individuals of the host noun, it is interpreted differently between the PreN-Q and the PostN-Q, as shown in (2a) and (2b). In (2a) the NQ *jyu-dan* shows the height of the stairway, while in (2b) the NQ shows the number of stairway steps Taro climbed.

There is no such kind of difference between (1a) and (1b). In both (1a) and (1b), the NQ *san-bon* quantifies over atomic rackets and shows the number of the rackets Taro broke.

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In this paper, assuming Japanese nouns have atomic and non-atomic distinction (Yoshida 2005) and the monotonicity constraints discussed by Nakanishi (2003) hold between the NQ and its host noun, I argue that the count classifier is interpreted as a measure classifier if the count classifier cannot pick up the atoms of the denotation of the host noun as shown in (2a). In (2a), the host noun *kaidan* is interpreted as a mass (or sum) in relation to the classifier. Furthermore, the interpretation of the classifier in relation to the host noun is derived by the function "partition" proposed by Chierchia (2010).

In the following discussion, the classifier of the NQ is called Count classifier if the NQ quantifies over atomic individuals of the head noun and counts the number of the atomic individuals. On the other hand, the classifier is called Measure classifier if the NQ does not quantify over atomic individuals of the head noun, but it measures various dimensions of a substance such as volume, weight, length, and height.

2. Monotonicity constraints

2.1. Nakanishi (2003)

Nakanishi (2003) extends Schwarzschild's (2002) analysis of pseudopartitives in English such as *2 liters of oil* to the PostN-Q construction in (3a) and the floating numeral quantifier (FNQ) construction in (3b). She argues that those two constructions must satisfy the two monotonicity constraints given in (4a) and (4b).

(3a)	[Mizu	san-rittoru]-ga	tsukue-nouede	koboreta.	
	[water	three-liter]-NOM	table-on	spilled	
	"Three liters of water spilled on the table."				(Nakanishi 2003: 230)
(3b)	Mizu-ga	tsukue-nouede	san-rittoru	koboreta.	
	water-NOM	table-on	three-liter	spilled	(Nakanishi 2003: 230)

(4) Monotonicity constraints on the Nominal Domain

(a) Constraint on the Host Noun

The host noun must have a part-whole structure, i.e., the extension of the host noun must be a lattice of individuals.

(b) Constraint on Measure Functions

The measure function T must be monotonic relative to the given part-whole structure, i.e., a lattice of individuals.

(Nakanishi 2003: 231)

Nakanishi (2003) assumes that the extension of Japanese nouns is mass. Thus, the host noun in (3a) – (3b), i.e., *mizu* "water" satisfies a part-whole relation and satisfies Constraint on the Host Noun, following Link's (1983) analysis

In this paper, following Yoshida (2005), I assume that, even though nouns in Japanese have atomic and non-atomic distinction, they have a part-whole structure, because they do not have any singular-plural distinction and bare forms are used for both singulars and plurals.

Constraint on Measure Functions in (4b) accounts for the difference in grammatical judgement between (3) and (5).

(5a) [Mizu san-do] -ga tsukue-nouede kobore-ta.
[water three-degree] -NOM table-on spilled
"Three degree water spilled on the table." (Nakanishi 2003: 230)

(5b) *Mizu-ga tsukue-nouede san-do kobore-ta.
water-NOM table-on three-degree spilled (Nakanishi 2003: 230)

Nakanishi (2003: 228) claims that Constraint on Measure Functions is satisfied if and only if "a measure obtained for an element x is larger than a measure obtained for a proper subpart of x." In (3a) and (3b), the volume of any subpart of 3 liters of water is less than 3 liters. Thus, Constraint on Measure Functions is satisfied in (3a) and (3b), and those examples are grammatical. On the other hand, Constraint on Measure Functions is not satisfied in (5a) and (5b) because the temperature of any subpart of three degree water should be three degrees and it cannot be less than three degrees. Therefore, the examples in (5a) and (5b) are ungrammatical.

2.2. A relation between a classifier and atomicity

Assuming Monotonicity constraints on the Nominal Domain given in (5), we now discuss the NQ constructions from a perspective of whether a classifier quantifies over atomic entities or not.

(6a) Taro-ga **san-bon-no** **tenisu raketto-o** otta. (PreN-Q)
NOM 3-CL-GEN tennis racket-ACC broke
"Taro broke three tennis rackets."

(6b) Taro-ga **tenisu raketto** **san-bon-o** otta. (PostN-Q)
NOM tennis racket 3-CL-ACC broke
"Taro broke three tennis rackets."

(7a) Taro-ga **jyu-dan-no** **kaidan-o** nobotta. (PreN-Q)
NOM 10-CL-GEN stairway-ACC climbed
"Taro climbed the stairway of ten steps."

(7b) Taro-ga **kaidan** **jyu-dan-o** nobotta. (PostN-Q)
NOM stairway 10-CL-ACC climbed
"Taro climbed up ten steps of the stairway."

The grammaticality of (6a) to (7b) shows that the monotonicity constraints in (5) are satisfied in those sentences. In other words, the nouns *raketto* "racket" and *kaidan* "stairway" are considered to have a part-whole structure in (6a) - (7b). Furthermore, *-hon* in (6a) and (6b), and *-dan* "step" in (7a) and (7b) should be monotonic for racket and stairway.

However, as noticed by Kato (2006), there is one crucial difference between (6a) and (6b) on one hand and (7a) and (7b) on the other. The NQ *classifier -hon* in (6a) and (6b) quantifies over the atomic entities of the host noun *tenisu raketto* "tennis racket", whereas the classifier *-dan* in (7a) and (7b) does not quantify over the atomic entites of the host noun *kaidan* "stairway". In other words, the classifier *-hon* in (6a) and (6b) counts the number of atomic rackets. On the other hand, the classifier *-dan* in (7a) and (7b) does not count the number of atomic stairways. Therefore, under Nakanishi' (2003) analysis, *-hon* is monotonic for *racket* since the number of any subpart of 3 rackets is less than 3. On the other hand, *-dan* is not monotonic for stairway since the number of any part of a stairway should be the same as the number of a stairway, namely, one.

Furthermore, as discussed by Kato (2006), whether a classifier quantifies over atomic entities of the host noun or not leads to a difference in the interpretation of the NQ between the PreN-Q construction and the PostN-Q construction. The NQ of the PreN-Q construction in (6a) has the same interpretation as that of the PostN-Q construction in (6b). In both examples, the NQ indicates the number of the rackets which Taro broke. In contrast, the NQ of the PreN-Q construction in (7a) is interpreted differently from that of the PostN-Q construction in (7b). The NQ *san-dan* in (7b) shows the number of steps of the stairway Taro climbed, while the NQ in (7a) shows the height of the stairway.

3. Previous analyses: Nakanishi (2003) and Kobuchi-Philip (2003)

Nakanishi (2003) compares the PostN-Q construction such as (8a) with the FNQ construction such as (8b) and argues that the NQ of the PostN-Q construction measures individuals denoted by the host noun in the nominal domain, whereas the FNQ measures individuals denoted by the host noun in the verbal domain, which leads to the measurement of events.

(8a) Gakusei go-nin-ga paatii-de utatta.
student five-CL-NOM party-at sang
"Five students sang at the party." (Nakanishi 2003: 226)

(8b) Gakusei-ga paatii-de go-nin utatta.
student-NOM party-at 5-CL sang
"Five students sang at the party." (Nakanishi 2003: 226)

However, Nakanishi (2003) does not discuss the PreN-Q construction.

On the other hand, Kobuchi-Philip (2003) discusses the PreN-Q construction and the PostN-Q construction. However, she discusses only the constructions which have the same NQ interpretation between the PreN-Q construction and the PostN-Q construction, such as the examples in (9a) and (9b). In those constructions, the NQ quantifies over the atomic entities of the host noun.

(9a) San-nin-no gakusei-ga hon-o katta.
3-CL-GEN student-NOM book-ACC bought
"Three students bought a book." (Kobuchi-Philip 2003: 68)

(9b) Gakusei san-nin-ga hon-o katta.
student 3-CL-NOM book-ACC bought
"Three students bought a book." (Kobuchi-Philip 2003: 68)

4. My analysis

In this paper, assuming that Japanese nouns have atomic and non-atomic distinction (Yoshida

2005), and the monotonicity constraints given in section 2.1. hold between the NQ and its host noun, I argue that the count classifier is interpreted as a measure classifier if it cannot pick up the atoms of the denotation of the host noun. Furthermore, the measure classifier interpretation in relation to the host noun is derived by the "partition" proposed by Chierchia (2010). This is observed in (2a), which is repeated as (10a) here.

(10a) Taro-ga **jyu-dan-no** **kaidan-o** nobotta. (PreN-Q)
NOM 10-CL-GEN stairway-ACC climbed
"Taro climbed the stairway of ten steps." (=2a)

(10b) Taro-ga **kaidan** **jyu-dan-o** nobotta. (PostN-Q)
NOM stairway 10-CL-ACC climbed
"Taro climbed up ten steps of the stairway." (=2b)

In (10a), the host noun *kaidan* "stairway" is interpreted as a mass (or sum) in relation to the classifier.

In (10b), the object argument of the verb is *jyu-dan* "ten steps" . In this case, the count classifier *-dan* denotes a set of atomic stairway steps and the numeral shows the number of atomic stairway steps, in contrast to (10a). The interpretation of (10b) is, however, also based on the "partition" used for the analysis of (10a).

In the following sections, I will discuss more details of my analysis.

4.1. Atomic and non-atomic noun distinction in Japanese

In this paper, following Yoshida (2005), I assume that Japanese nouns have atomic and non-atomic distinction. Yoshida (2005) notices some differences between Japanese counterparts of English mass nouns and count nouns, given in (11) – (13):

(11) a. tasuu-no shimin / many citizens / "many citizens" — b. *taryo-no shimin / much citizens / "much citizens"

(12) a. *tasuu-no mizu / many water / "many water" — b. taryo-no mizu / much water / "much water"

(13) a. dono ringo / which apple / "which apple" — b. *dono gasu / which gas / "which gas"

First, Japanese counterparts of English count nouns are used with the quantifier *tasuu* "many", but not with taryo "much" , whereas Japanese counterparts of English mass nouns are used with taryo "much", but not with *tasuu* "many" , as shown in (11a) to (12b). Second, the Japanese wh-word *dono* "which" that tries to identify an individual can be attached to Japanese counterparts of English count nouns such as *ringo* "apple" in (13a), but it cannot be attached to the counterparts of English mass nouns such as *gas* "gas" in (13b). These differences show that Japanese nouns have atomic and non-atomic distinction.

4.2. The count classifier

In this section, I will discuss the interpretation of the count classifier.

Following Ionin and Matushansky (2006), Chierchia (2010) assumes that numbers are of type <<e,t>,<e,t>> and gives the following analysis of the "number" given in (14) and (16):

(14) $[_{NumP}$ n P$]$ → λP λx [$\mu_{AT.}$ P(x)=n] (NumP=Number Phrase, n=number)

(15) For any *x*, and any *P*, $\mu_{AT.}$ *P(x)* is defined only if (i) *P(x)* holds and (ii) *P* has stable atoms;
if defined, $\mu_{AT.}$ *P(x)*=the number of stable *P*-atoms that are part of *x*

(16) three cats → λx [$\mu_{AT.}$ cats (x)=3]

As shown in (14), a number *n* combines with a property *P* (e.g. cats in (16)) and returns a property true of groups of exactly *nP* (e.g. *3 cats* in (16)). Furthermore, as shown in (15), [$\mu_{AT.}$ *P(x)*] --- the measure function μ_{AT} can apply to *P(x)* only if (i) *P(x)* holds and (ii) *P* has stable atoms; if defined, $\mu_{AT.}$ *P(x)*=the number of stable *P*-atoms that are part of *x*. Crucially, this analysis of numbers presupposes that a property *P* needs to have stable atoms.

Under my analysis, adapting the definition of "numbers" by Chierchia (2010), I assume the following conditions for a count classifier:

(17) The meaning of a numeral count classifier $\mu_{AT.Q}$ *P(x)* is defined if and only if for any *x*, *P,* and *Q*, (i) *P(x)* holds and (ii) *P* has stable atoms each of which has *Q* property; if defined, $\mu_{AT.Q}$ *P(x)*=the number of stable *P*-atoms that are part of *x* and that each has a property *Q* denoted by the classifier

Q in (17) is the property of the classifier. *P* comes from the host noun. Thus, in this analysis, the numeral count classifier counts stable atoms each of which has a property *Q* denoted by the classifier.

Under this analysis, (18a) and (18b) are given the interpretations in (19a) and (19b), respectively.

(18a) Taro-ga **san-bon-no** **tenisu raketto-o** otta. (PreN-Q)
NOM 3-CL-GEN tennis racket-ACC broke
"Taro broke three tennis rackets." (=1a)

(18b) Taro-ga **tenisu raketto** **san-bon-o** otta. (PostN-Q)
NOM tennis racket 3-CL-ACC broke
"Taro broke three tennis rackets." (=1b)

(19a) ∃x [broke (Taro, x) ∧ <u>∃Y [$\mu_{AT.HON}$ Y (x)=3]</u> ∧ racket (x)]

(19b) ∃x [broke (Taro, x) ∧ $\mu_{AT.HON}$ racket (x)=3]

The classifier *-hon* in (18a) and (18b) has a property "being a long slender object" (HON) as shown in (19a) and (19b). In (19a), the property *P* in (14), which is given a variable *Y*, is not specified by any specific property. Thus, the underlined part in (19a) is the denotation of a numeral classifier. In (19a), each atomic individual of the sum *x* has both the property *-hon* and the property *racket'*.

This contrasts with (19b). In (19b), the property *racket'* is assigned to *P* in (14) and the sum of *racket'* is counted to be three long slender entities. Thus, the sum *x*, which is the object of the verb *otta* "broke", is interpreted as three long entities.

However, in both examples, the sum of rackets, which is the object of the verb, is interpreted as three slender entities as well as atomic rackets.

4.3. The mass classifier derived from the count classifier

In this section, I will discuss how the mass classifier is derived from the count classifier.

As for (2a) and (2b), the classifier *-dan* cannot count the number of atomic stairways though it counts the number of atomic steps. However, assuming Constraint on Measure Functions (Nakanishi 2003), the grammaticality of the PostN-Q in (2b) shows that the classifier *-dan* is monotonic relative to the part-whole structure of the denotation of the host noun NP *kaidan* "stairway". Since the NQ with the classifier *-dan* cannot quantify over the atomic entities of *kaidan* "stairway", I assume that the stairway can be interpreted as a sum of steps in relation to the classifier *-dan*. Furthermore, the classifier *-dan* in (2a) shows the height of a stairway. In this analysis, adopting Chierchia's (2010) proposal of the function "standardized partition (Π_{ST})", a stairway is subdivided into standardized atomic countable parts (i.e., steps) salient in a context.

According to Chierchia (2010), a partition Π is a function of type <<e,t>,<e,t>>. It must satisfy the following conditions:

(20) a. $\Pi(P) \subseteq P^{+}$
A partition of P is a total subproperty of P.
b. $AT(\Pi(P)) = \Pi(P)$
If x is a member of a partition of P, no proper part of x is (relative atomicity).
c. $\forall x[\Pi(P)(x) \rightarrow \forall y\ [\Pi(P)(y) \rightarrow \neg \exists z[z \leq x \wedge z \leq y]]]$
No two members of a partition overlap. (Chierchia 2010: 125)

The notion of 'atomicity' is relative to contexts. A function AT extracts their smallest elements from properties or their smallest components from individuals in a certain context, as shown in (21):

(21) a. $AT(\{a, b, a \cup b\}) = \{a, b\}$
b. $AT(\{a \cup b, b \cup c, a \cup b \cup c\}) = \{a \cup b, b \cup c\}$

In (21a), the smallest elements are *a* and *b* and they are atomic in the context. In (21b), $a \cup b$ and $b \cup c$ are the smallest components and atomic in this domain even though they are not a bottom element in the semilattice structure.

Chierchia (2010) argues that words such as *quantity of* are variables over partitions. Under this analysis, suppose that we have five apples (a, b, c, d, e). Two of them, e.g., (a, b) are in a bowl and the other three apples are on a tray. In this situation, *quantity of apples* is shown in (22):

(22) [quantity of apples] $\rightarrow \Pi$ (apples) $= [a \cup b, c \cup d \cup e]$

In (22), aub and cudue are stable minimal parts.

Chierchia's "partition" analysis can be extended to mass nouns. It can apply to quantity of water as shown in (23):

(23) a. There are two quantities of water on the table.
b. $\exists x\ [\mu_{AT.}\Pi(\text{water})(x)=2 \wedge \text{on the table } (x)]$

Two quantities of water in (23a) denotes two minimal parts of water based on contextually salient partition, as shown in (23b).

Under Chierchia's analysis, the "standardized partition" (Π_{ST}) is a type of partition which is constituted by naturally occurring bounded units. For example, *rope* usually occurs in standardized bounded units.

4.4. My analysis of the PreN-Q and the PostN-Q in which a classifier cannot quantify over atomic entities

Assuming the standardized partition discussed above, the interpretations in (25a) and (25b) are each given to (2a) and (2b), which are repeated as (24a) and (24b).

(24a) Taro-ga **jyu-dan-no** **kaidan-o** nobotta. (PreN-Q)
NOM 10-CL-GEN stairway-ACC climbed
"Taro climbed the stairway of ten steps." (=2a)

(24b) Taro-ga **kaidan** **jyu-dan-o** nobotta. (PostN-Q)
NOM stairway 10-CL-ACC climbed
"Taro climbed up ten steps of the stairway." (=2b)

(25a) $\exists y\ [\text{climbed (Taro, y)} \wedge \underline{\exists x\ [\mu_{AT.STEP}\ \Pi_{ST}(y)(x)=10]} \wedge \text{stairway } (y)]$
(25b) $\exists x\ [\text{climbed-up (Taro, x)} \wedge \mu_{AT.STEP}\ \Pi_{ST}\ (\text{stairway})\ (x)=10]$

In (24a), the verb *climb* takes *y*, i.e., a stairway as its argument as shown in (25a). However, the classifier *-dan* "step" does not quantify over atomic stairways. Therefore, *y* is interpreted as a mass or a sum in relation to the classifier *-dan*, and it is subdivided into atomic steps *x* by the function "standardized partition" (Π_{ST}). The NQ with the classifier *-dan* has the underlined denotation in (25a). In this denotation, the variable *y* has subparts, the number of which is 10. Furthermore, the variable *y*, i.e., a stairway is an argument of the verb. Thus, the sentence in (24a) has the meaning in which Taro climbed the stairway of ten steps.

In (24b), the verb *climb* takes *x*, i.e. steps as its argument, as shown in (25b). The *x* is a partition generated by the Standardized partition applying to *stairway*. *kaidan* "stairway" is subdivided into atomic steps by the function "partition". As a result, the partition consists of 10 atomic steps and it is interpreted as the argument of the verb *climb*. Therefore, the sentence in (24b) has the meaning in which Taro climbed up ten steps of the stairway.

5. Three phenomena to support my analysis.

There are three phenomena to support my analysis.

5.1. Counting events tantamount to counting participants

First, given Schwarzschild's (2009) analysis of mass and count nouns, the noun *kaidan* "stairway" in (2a) is interpreted as a mass noun in relation to *-dan* "step".

Schwarzschild (2009) argues that with count nouns, there is a reliable one-to-one correspondence between events and participants and that counting events is tantamount to counting participants, as shown in (26):

(26) John ate four apples. → There are four events of John eating an apple.
(27) John spilled three liters of oil. − X → There are three events of John spilling a liter of oil.

In (26), the number of apples is tantamount to the number of events of eating an apple. Thus, the noun *apple* in (26) is a count noun. On the other hand, in (27), the number *three* does not have to reflect the number of events of John spilling oil. For example, there might have been two events. One of those two events might be the event of John spilling 1.7 liters of oil and the other event might be the event of John spilling 1.3 liters of oil. Thus, the noun *oil* in (27) is considered as a mass noun.

Assuming Schwarzschild's (2009) analysis, the NP in (2a) is not interpreted as a count noun in relation to the classifier *-dan*. The NQ adjacent to the noun *kaidan* "stairway" is not tantamount to the number of events of climbing a stairway. This shows that the noun *kaidan* "stairway" in (2a) is interpreted as a mass noun in relation to *-dan* "step" and that the classifier is not a count classifier but a measure classifier. This supports my analysis since under my analysis the noun *kaidan* in (2a) is interpreted as a mass as discussed in section 4.4. On the other hand, the classifier *-dan* in (2b) is interpreted as a count noun since the NQ with *-dan* is tantamount to the number of events of going up a step.

5.2. The floating quantifier (FQ) construction

Second, under Kobuchi-Philip's (2003) analysis of the FQ construction in Japanese, my "partition" analysis of the classifier interpretation does not face a problem with the FQ construction, whereas the "non-partition" approach has it.

Kobuchi-Philip (2003) argues that, in the FQ construction, the meaning of the classifier first combines with the meaning of a verb, and then the meaning of the host noun combines with the composition of the meanings of the classifier and the verb, as shown in (28) and (29).

(28) Gakusei-ga san-nin hashitta.
student-NOM 3-CL ran
"Three students ran." (Kobuchi-Philip 2003)

(29) $\exists y[\text{gakusei}'(y)\ \&\ \exists K[K \subseteq K(\underline{\lambda u \exists v}[\underline{\text{nin}'(v)\ \&\ u \cdot \Pi v}] \cap \text{hashitta}')\ \&\ |K| \geq 3\ \&\ \oplus K = y]]$

In (29), the predicate *hashitta' "ran"* denotes a set of individuals. The classifier *-nin* quantifies over atomic individuals as illustrated by the underlined denotation. Therefore, a subset *K* of the intersection of the sets denoted by *ran* and by *-nin* consists of atomic individuals which have the properties *run'* and *-nin*. Furthermore, the supremum of K, i.e. ⊕ K, which is *y*, also has the property of being student. In other words, each atomic individual of *y* has the property of *student'*.

Under this assumption, as for (2b), which is repeated as (30), the intersection of the sets denoted by *nobotta* "climbed" and by *-dan* consists of atomic steps which are climbed, as shown in (31). However, the semantic interpretation in (31) faces a problem. In this interpretation, the supremum of K, i.e., *y* has a property of *kaidan* "stairway" as well as a property *-dan* "step" . Thus, the interpretation in (31) incorrectly says "Taro climbed the stairway of ten steps."

(30) Taro-ga **kaidan-o** **jyu-dan** nobotta. (FNQ)
NOM stairway 10-CL-ACC climbed
"Taro climbed up ten steps of the stairway."

(31) $\exists y[\text{kaidan}'(y) \,\&\, \exists K[K \subseteq (\lambda u \exists v[\text{dan}'(u) \,\&\, u \cdot \Pi v] \cap \text{nobotta}'(t, x)) \,\&\, |K| \geq 10 \,\&\, \oplus K = y]]$

Under my analysis, the function "partition" applies to the predicate *stairway* and the example in (30) has the interpretation in (32):

(32) $\exists y[\text{stairway}(y) \wedge \exists x[\mu_{\text{AT.STEP}} \Pi_{\text{ST}}(y)(x) = 10 \wedge \text{climbed-up}(\text{Taro}, x)]]$

In (32), *y,* which has a property *stairway'*, is subdivided into atomic steps by the function "standardized partition". Furthermore, the partition of a stairway, i.e., atomic steps *x* is interpreted as the argument of the verb *climb-up*. Therefore, the semantic interpretation in (32) does not face the problem which the "non-partition" approach has.

5.3. The FQ construction with a collective predicate

Third, under Kobuchi-Philip's (2003) analysis of the FQ construction, my analysis can be extended to the FQ construction with a collective predicate given in (33).

(33) Gakusei-ga jyu-nin shuugoshita.
student-NOM 10-PERSON gathered
"10 students gathered."

The verb *shuugosuru* "gather" takes an atomic group as its argument and is assumed to denote a set of atomic groups as shown in (34), following Landman (1989):

(34) Gakusei-ga hito-kumi atsumatta.
student-NOM one-GROUP gathered
"A group of students gathered."

In (34), the classifier *-kumi* quantifies over groups. On the other hand, the classifier *-nin* in (33) denotes a set of individuals. Thus, assuming Kobuchi-Philip's (2003) analysis, it is predicted that the meaning of the classifier *-nin* in (33) cannot combine with the meaning of the verb *gather* as they are. Under my analysis, after the function "partition" applies to the predicate "gather", the predicate denotes a set of partitions, each of which consists of atomic individuals. As a result, the meaning of *gather* can combine with the meaning of the classifier *-nin*, as shown in (35):

(35) $\exists x[\text{student}(x) \wedge \exists y[\mu_{\text{AT. PERSON}} \Pi_{\text{ST}}(y)(x)=10 \wedge \text{gather}(y)]]$

6. Conclusion

In this paper, I account for the difference in the interpretation of the NQ between the PreN-Q construction and the PostN-Q construction, by adopting the idea of "partition" proposed by Chierchia (2010). When the NQ does not quantify over the atomic individuals of the host noun, it is interpreted differently between the PreN-Q and the PostN-Q, as noticed by Kato (2006). In my analysis, when the NQ quantifies over the atomic individuals of the host noun, the classifier counts atomic entities of the host noun. On the other hand, when the NQ does not quantify over the atomic individuals of the host noun, the host noun is interpreted as a mass (or sum) in relation to the classifier. In this case, the function "partition" applies to the host noun and the classifier counts the number of the members of this partition.

My analysis supports Chierchia (2010) in that even in Japanese, the mass/count distinction of a noun is not absolute. It varies in an atom-matching relation to the meaning of a classifier.

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