How can corpora improve multiple choice grammar questions with multiple correct answers? The case of the relative pronoun *who*

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1. Introduction

Techniques of corpus analysis have been used to describe vocabulary and grammar, aiding the creation and improvement of dictionaries, word lists and grammars. Corpus linguistics has also been applied to various linguistic analyses, and recently corpora have been utilised in language testing (e.g. Barker 2010). However, this kind of research is relatively new and a framework for applying corpora and corpus techniques to language testing has not yet been fully developed, though both general corpora and learner corpora could be utilised in language testing in various ways.

For example, one way that corpora could be used is in creating language test items or validating existing questions. Some exam boards such as ETS and Cambridge ESOL have compiled their own corpora to increase the validity of their tests (e.g. Biber et al. 2004; Barker 2006). Japanese university entrance exams have not yet had corpus techniques applied to them, though there could be a good case for doing so: such tests have been criticised for containing problematic items in terms of reliability and validity (e.g. Brown 1996; Kobayashi 2007). Some questions may not reflect authentic uses of English, for example, there may be two or more possible 'correct' answers to a multiple choice question when the question is checked against a reference corpus of naturally occurring English. However, there have been few attempts to systematically identify which items are problematic. Despite such criticisms, more work needs to be carried out in order to examine the extent to which individual items are problematic.

Therefore following previous research, I examine whether corpus linguistic techniques can be used effectively in order to improve language

tests. I choose multiple choice grammar questions in Japanese university entrance exams from an exam corpus I created called the UEEJ Corpus, and use the BNC (British National Corpus) in order to check the grammaticality of a possible correct answer presented in the UEEJ Corpus. In this study, I selected questions testing the relative pronoun *who* used as a subject in an inserted clause because the questions testing this grammatical feature have more than one possible correct answer. I then give an existing non corpus based test and a corpus based test to Japanese EFL students, and present statistical analysis in order to examine to what extent a corpus based test is effective.

Section 2 reviews the relevant literature and presents the research questions that this paper wishes to address, and Section 3 presents the data and the methodology. In Section 4, I describe how the questions with more than one possible correct answer are presented in the exams and how these questions can be improved by using the data in the BNC. Finally in Section 5, I conclude that the questions with more than one possible correct answer can be improved with general corpora and corpus linguistic techniques.

2. Literature review

2.1 Application of corpora to language testing

Initially a main use of corpora was to describe aspects of language such as vocabularies (in terms of individual words, phrases, collocations, and word meanings) and grammar. However gradually, reflecting the idea that corpus linguistics is "a methodology" (McEnery and Wilson, 2001: 2), corpus-based lexical and grammatical descriptions (e.g. Biber, 2001) have been applied to compile dictionaries (e.g. the *Collins COBUILD English Dictionary*), word lists (e.g. Leech et al. 2001) and grammars (e.g. Biber et al. 1999). Moreover, these corpus-based lexical and grammatical descriptions have been applied to various kinds of linguistic analyses in a number of ways, such as critical discourse analysis, stylistics, translation, forensic linguistics, cultural studies and psycholinguistics.

In the area of language teaching, these descriptions have been applied to the design of teaching materials where it is mainly argued that more frequent words or grammatical constructions should be learned earlier than

those which occur less frequently (e.g. Mindt, 1996; Shortall, 2003). However, so far, there is only a small amount of research based on applying corpus-based descriptions to language testing, although it is argued that corpora have much more potential in this field (e.g. Hunston 2002: 205). However, scholars in both language testing and corpus linguistics have earlier implied or suggested that corpora can play a role in language testing both theoretically and practically (e.g. Heaton 1988; Alderson 1996; Hughes 2003).

Theoretically, Alderson (1996: 252-257) has suggested that corpora should be utilised in terms of "i) test construction, compilation and selection, ii) test presentation, iii) response capture, iv) test scoring and v) calculation and delivery of results". Moreover, he points out that not only general corpora, but also learner corpora can be useful in construction language tests because learner corpora contain types of language that learners have difficulty mastering. For another example, Ball (2001: 7) and Barker (2004: 66) in Cambridge ESOL suggest the following aspects of corpus-informed research; "i) developing examination materials, ii) standardisation across examinations, and iii) comparative activities".

Practically, Hughes (2003: 73, 174) recommends the use of corpora such as the BNC and the COBUILD Corpus so that items can be written "in grammatically correct and natural language". Moreover, regarding writing the answer and distractors,[1] Heaton (1988: 31) points out that native speakers' intuition is sometimes wrong;

> Error: "I suppose that you were not angry to me."
> Item: I do hope you weren't angry ….. me.
> A. to B. with C. on D. about
>
> (Heaton 1988: 31)

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[1] In multiple choice items,
there is a stem: Enid has been here _____ half an hour.
and a number of options – one of which is correct, the others being distractors:

A. during B. for C. while D. since

(Hughes 2003: 75)

In the above questions, *at* could be considered as another possible distractor. However, at the same time, a lot of native speakers of English say *angry at* a person. Heaton (1988: 31) argues that it is subjective to decide whether *at* is included in one of the distractors or not. However, naturally occurring data in general corpora may be useful in examining whether a particular expression does occur in native speaker English or not so that there cannot be more than one possible correct answer.

2.2 Concrete research studies

Reflecting the suggestions mentioned above, some concrete research on the application of corpora to both setting and marking tests has been carried out. For example, Coniam (1997) and Rees (1998) have developed cloze tests using corpora, while Shillaw (1994) has developed vocabulary tests with a corpus of high school textbooks in Japan. Merino (2000) has developed corpus-based vocabulary tests, while in terms of marking tests, Howarth (1998) examined lexical collocations in written essays, and Hasselgren (2002) assessed learners' fluency using a learner corpus.

Moreover, as a much larger-scale project, the Cambridge ESOL has compiled the Cambridge Learner Corpus (CLC) containing test takers' writings, which have been annotated for errors (e.g. Nicholls, 2003), and lexicons with concordances or collocations (Barker, 2005; 2006). Researchers using the CLC have created word lists in order to aid the creation of items for different exams (Ball, 2002), developed a common scale for writing (Hawkey & Barker, 2004), analysed test takers' lexis (Horner & Strutt, 2004) and compared test takers' vocabularies against word lists from the corpus (Taylor & Barker, 2006). In a more recent paper, Barker (2006: 2-3) describes research in Cambridge ESOL and updates possibilities where corpora can be applied to language testing. In terms of writing items, corpora can be applied "1) to establish authentic contexts for a target item (content and language), 2) to generate language which reflects natural authentic usage, 3) to find the most common form for a target item (e.g. singular or plural noun) and 4) to check whether their intuitions about an aspect of language to be tested are correct" (Barker 2006:2-3).

In addition, from a point of view of examining and assessing test contents, Purpura (2004) points out the frequency and distribution of lexical items in corpora can be applied in order to determine the contents of a test. For example, Biber et al. (2004) constructed the TOEFL 2000 Spoken and Written Academic Language (T2K-SWAL) Corpus and assessed the English used in T2K Listening and Reading Comprehension tasks, compared with the English used in spoken and written academic registers.

2.3 Issues in Japanese university entrance exams

Among the many types of English proficiency tests around the world, Japanese university entrance exams have been criticised in a number of ways. In terms of technical aspects, Brown (1996) argues that the exams are sometimes written by inexperienced test writers, and that they are not piloted, analysed statistically, revised or reported publicly, due to issues of test security. Moreover, multiple choice grammar questions in Japanese university entrance exams sometimes have more than one possible correct answer, the stems in the exams are used repeatedly and the English used and tested in the exams is both old (and thus out of date) and different from the English actually used (e.g. Watkins et al. 1997; Kobayashi 2007). However, if exams are not analysed or revised, the quality of items cannot be improved. One way of analysing items is to consider them in relation to the ways that language is actually used. For this reason, it has been decided to take a corpus linguistics perspective to examining test items and revising existing questions.

Therefore, following the above research in large-scale language tests, it is worth examining each item in Japanese university entrance exams with corpus based methods. Concrete issues related to the quality of the items in multiple choice grammar tests in these exams have not yet been examined. In addition, as seen above, concrete research has been carried out in terms of different language skills and different applications of corpora. Boyle & Booth (2000), Ball (2001) and Barker (2004) suggest that collocations and word lists could be used in order to create authentic stems and appropriate distractors. Therefore, based on these points, this study addresses the following research questions:

i) Taking the case of questions that test the relative pronoun *who*, how can corpora and corpus linguistic techniques be applied to demonstrate that certain multiple choice grammar questions have more than one possible correct answer?

ii) For the above case, how can corpora and corpus linguistic techniques be applied to improve such questions?

3. Data and methodology

3.1 The UEEJ Corpus

For the purposes of this research, I used the University Entrance Examinations in Japan (UEEJ) Corpus, which contains 5,038 multiple choice grammar questions from Japanese private university entrance exams and from the Center Test (the most authorised National Center Test for University Admissions) and 133,576 words collected from the most popular test book in Japan *Zenkoku Daigaku Nyushi Mondai Seikai* (Obunsha, 2002-2007). A coding scheme was applied to each question as follows; i) RF reference number, ii) NU name of university and iii) YE year presented. In order that various parts of each question could be quickly identified with the searchable corpus analytical tool, WordSmith Tools (version 3 Scott, 1996), the part of each question which denotes the missing word was relabeled as zzz, while the correct option in each case was prefaced with the code XX. Below shows an example of the coding scheme applied to a question:

Figure 1: A sample file in the UEEJ Corpus

<RF>20001
<NU>Sapporo
<YE>02
Do you know by any chance what has become zzz Yamada?
XXA)of B)for C)with D)in

3.2 The British National Corpus

The English that the Ministry of Education, Culture, Sports, Science and Technology advocates Japanese learners should acquire is considered to be the English used in a daily life. Therefore, in this research, I use a general

'reference' corpus containing native speakers' written and spoken English as a target language corpus. The British National Corpus (BNC) is composed of 100 million words of modern British spoken (10%) and written (90%) English and is well balanced, containing a wide variety of different types of written and spoken English. It is part of speech tagged with the CLAWS4 tagging system developed at Lancaster University (Aston & Burnard, 1998). For this research I use only written texts in the BNC because spoken texts do not always contain grammatically well-formed uses of language.

3.3 Methodology

Machine-readable or electronic corpora allow us to analyse texts in various ways. To analyse the BNC I used BNCweb - an internet-based integrated system of the BNC complete with a range of analytical tools. WordSmith Tools (version 3.0 see Scott, 1996), which is a software package used with any set of texts, is used to analyse the UEEJ Corpus. Among various kinds of processes or methodologies available in corpora Hunston (2002) introduces, I use concordances (tables showing all of the occurrences of a word or phrase, in their immediate context).

Moreover, in order to analyse multiple choice questions, I used the analytical software called ITEMAN, which provides detailed distractor analysis including the percentages of test takers who chose each option according to different proficiency levels of that test.

4. Analysis and discussion

4.1 Questions testing the relative pronoun *who* in the UEEJ Corpus

The word *who* is mainly tested as either a relative pronoun or an interrogative in grammar questions. In this research, I focus on the relative pronoun *who* used as a subject in an inserted clause. Quirk et al. (1985: 368) refer to the clause with this relative pronoun *who* as "a PUSHDOWN relative clause" and give the following example, which they label as grammatically incorrect:

> *The Ambassador, whom we hope will arrive at 10 a.m.,…
>
> (Quirk et al. 1985: 368)

In the above sentence, the relative pronoun *whom* is incorrectly used as an object of the inserted clause *we hope*. However, instead, the relative pronoun *who* should be used as a subject of the verb phrase *will arrive at 10 a.m.*, assuming the sentence *we hope* is inserted.

In this section, I describe how I obtained a representative question testing the relative pronoun *who* used as a subject in an inserted clause with relatively representative distractors presented in the UEEJ Corpus. First, I put the word *who* into the search box in the UEEJ Corpus and selected the concordance lines where *who* is used as a relative pronoun and is the subject in an inserted clause. This resulted in the following cases as shown in Table 1.

Table 1: Concordance where the relative pronoun *who* is tested as a subject in an inserted clause in the UEEJ Corpus

File No.	Concordance lines		
60101	Ken is a student zzz the teachers believe is honest. A)what	XXB)who	C)whose D)whom
70359	The man zzz I had believed was an actor turned out to be the president of the country.	XXA)who	B)whose C)whom D)which
30329	The woman, zzz we believed was in her thirties, had three grandchildren. A)such as B)what	XXC)who	D)whom
50540	The gentleman over there is Mike's uncle, zzz they say is a jazz pianist. A)whoever B)of whom	XXC)who	D)which
30628	I met a man zzz I thought was an actor. A)which B)what	XXC)who	D)whose
60775	Nobody wants to employ John, zzz everybody knows is dishonest. A)what B)which	XXC)who	D)whoever E)whomever

Table 1 presents six questions testing the relative pronoun *who* used as a subject in an inserted clause. Out of six questions, the first three questions

have the distractor *whom*, which some native speakers have claimed is a possible acceptable answer. These three questions were presented in different years and universities.

Out of the three questions that have the distractor *whom* in Table 1, I present the following question as a representative UEEJ question with the relative pronoun *whom*, which native speakers claim is acceptable and has relatively frequent distractors such as *whose* and *what*;

(File No. 60101) Ken is a student zzz the teachers believe is honest.

A) what XXB) who C) whose D) whom

In the following section, I examine the extent to which native speakers are able to follow the prescriptive rules of *who* and *whom*, by looking at the BNC.

4.2 Examples in the BNC

In the previous section, I obtained a relatively representative question from the UEEJ Corpus which tests the relative pronoun *who* used as a subject in an inserted clause and has more than one possible correct answer. In this section, I demonstrate whether one of the distractors, *whom*, which native speakers claim to be acceptable is found in the BNC, even though it is not acceptable in prescriptive grammars.

To see whether these sorts of structures occur in general English, first, I obtained concordance lines of the relative pronoun *who* used as a subject in an inserted clause in BNCweb. I focused on only the written texts of the BNC because spoken texts would contain grammatically incorrect examples. I will focus on the verb BELIEVE because it is frequently used in questions testing the relative pronoun *who* used as a subject in an inserted clause in the UEEJ Corpus shown in Table 1, though other verbs such as THINK, SAY and KNOW also tend to be used in similar contexts. I put *who _{PRON} {believe/V} _{VERB}* into BNCweb's search box, and I obtained 20 concordance lines, of which a sample are shown in Table 2.

Table 2: Sample concordance lines of the relative pronoun *who* used as a subject in an inserted clause in written texts of the BNC

1	ADK 1514	You know someone **who you believe is** a supporter and in conversation it's mentioned that he regularly gives to charities.
2	AHN 30	There are 80 to 100 members **who I believe will** support the group after the election.
3	AR7 297	I realise there may be many runners **who I believe have** not yet heard of this relatively new organisation.

As Table 2 shows, it is true that the relative pronoun *who* used as a subject in an inserted clause actually occurs in written texts of the BNC. However, the relative pronoun *whom* used as a subject in an inserted clause, which is presented as one of the distractors in the UEEJ Corpus, also occurs in similar contexts in written texts of the BNC. I put *whom _{PRON} {believe/V} _{VERB}* into BNCweb's search box, and obtained 11 concordance lines. Table 3 shows sample concordance lines that were found.

Table 3: Sample concordance lines of the relative pronoun *whom* used as a subject in an inserted clause in written texts of the BNC

1	A1A 600	Norris is at some pains to extricate Derrida's meanings from the American literary critics **whom he believes have** misappropriated them.
2	A96 348	ATURKISH print worker alleged yesterday that a Harley Street doctor paid £2,500 for him to donate a kidney to a patient **whom he believed was** a fellow countryman.
3	AN4 600	If Duncombe was himself an unaccomplished poet, he certainly laboured to promote the work of women **whom he believed had** been undervalued.

According to Table 3, the relative pronoun *whom* used as a subject in an inserted clause does occur in authentic English, though it is less frequent than when the relative pronoun *who* is used in the same context. In order to obtain more evidence, I examined other cases where relative pronouns *who* and *whom* are used as a subject in an inserted clause with three other

verbs, SAY, THINK and KNOW, all of which tend to be used in an inserted clause. The frequencies of such sentences are shown in Table 4.

Table 4: The occurrences of relative pronouns *who* and *whom* as a subject used in an inserted clause with BELIEVE, SAY, THINK and KNOW in the BNC

Relative pronouns / Verbs	BELIEVE	SAY	THINK	KNOW	Total
Relative pronoun *who*	20	27	39	30	116
Relative pronoun *whom*	11	4	20	12	47

As seen in Table 4, in these contexts *whom* is less frequent in the BNC, compared with *who*. For example, in the cases of BELIEVE and THINK, *whom* occurs approximately half as much as *who*, while in the cases of SAY and KNOW, *whom* occurs considerably less frequently.

If native speakers of English experience difficulty in correctly distinguishing *who* and *whom*, then it might be asked whether it is fair to expect Japanese learners of English to be able to do the same. Therefore, in order to improve the test question, I replaced the option for *whom* with another frequent distractor presented in the UEEJ Corpus, *which*, resulting in the following question.

(File No: 60101 altered) Ken is a student zzz the teachers believe is honest.
A) what XXB) who C) whose D) which

The stem in the question (File No. 60101) is kept in the question (File No. 60101 altered). The distractor D) *whom* in the question (File No. 60101), which native speakers of English claim is a possible correct answer, is replaced with the distractor D) *which* in the question (File No. 60101 altered), which is an another frequent distractor in the UEEJ Corpus. However, the distractors A) *what* and C) *whose* and the answer B) *who* in the question (File No. 60101) remain the same in the question (File No. 60101 altered). As a result, the original question is given as Test X and the altered question will be given as Test Y as follows;
(Test X) Ken is a student zzz the teachers believe is honest.

A) what XXB) who C) whose D) whom

(Test Y) Ken is a student zzz the teachers believe is honest.

A) what XXB) who C) whose D) which

4.3 Test analysis

This section presents analysis for tests I gave to 343 Japanese EFL participants. The participants were presented with 60 questions, half of which were taken from the original Japanese university entrance exams, the other half were based on the entrance exams but had been improved via the use of corpus methods. The participants were given the questions in different orders to avoid the "order effect". All participants received the UEEJ question above which tests the relative pronoun *who*, as well as the altered version of that question.

I analysed multiple choice questions in terms of the item facility (IF), discrimination index (DI) and distractor analysis using the software called ITEMAN. The item facility measures how difficult an individual item is. According to Bachman (2004: 138), the ideal item facility for norm-referenced tests[2] is .50, though a range between .20 and .80 is acceptable. The discrimination index is a measure of whether a question was answered correctly by people who overall scored in the top 1/3 of the test, and incorrectly by those who scored in the bottom 1/3 of the test. A high DI means that the item is good at discrimination between strong and weak students. According to Bachman (2004: 138), the ideal item discrimination indices for norm referenced tests are equal to or greater than .30.

My results below only focus on how participants answered these two questions, rather than looking at the whole test (this is discussed in more detail in my PhD thesis). I obtained the item facility, the discrimination index and the percentages of the participants who chose each option as follows;

[2] A norm-referenced test is defined as "a type of test whereby a candidate's scores are interpreted with reference to the performance of the other candidates". (Davies et al. 1999: 130).

Table 5-1. The distractor analysis of the relative pronoun *who* in Test X

Stem	Ken is a student zzz the teachers believe is honest.			IF: .44	DI: .45
Options	A) who	B) whom	C) what	D) whose	
Total	.44	.27	.06	.20	
High	.75	.18	.03	.05	
Low	.30	.24	.10	.25	

Table 5-2. The distractor analysis of the relative pronoun *who* in Test Y

Stem	Ken is a student zzz the teachers believe is honest.			IF: .55	DI: .41
Options	A) who	B) which	C) what	D) whose	
Total	.55	.07	.07	.27	
High	.83	.03	.03	.10	
Low	.38	.07	.10	.33	

Notes: IF indicates item facility, while DI indicates discrimination index.
Total means all the test takers on this test, High means high proficiency test takers on this test and Low means low proficiency test takers on this test.

As Tables 5-1 and 5-2 show, in terms of statistical analysis, Test X, which is taken from the exam, is not working well, while Test Y, which is created using the BNC, is working relatively well. As for the item facility, the item facility of Test X is .44, which indicates Test X is slightly difficult for a norm-referenced test. This result is probably because the possible correct answer *whom* is presented as one of the distractors and some participants might not have been able to choose the correct answer, though they had been told that *whom* is a typical error. If we view the option B) *whom* as a correct answer, then the real IF for Test X is .71 (.44 + .27), which would suggest that quite a high number of participants are getting the question right, even if only 44% of them get a mark for it. On the other

hand, the item facility of Test Y is .55, which indicates that Test Y is slightly easy for a norm-referenced test, although still within a reasonable range. The discrimination index of Test X is .45, while the discrimination index of Test Y is .41, which indicates both Test X and Test Y discriminate reasonably.

The values for item facilities and discrimination indices in both Test X and Test Y are similar and reasonable. However, there is quite a difference in the distractor analysis. In Test X, the possible correct answer B) *whom* is relatively frequently chosen. Twenty-seven % of all the participants, 18% of high proficiency participants and 24% of low proficiency participants chose the possible correct answer B). The distractor C) *what* is less frequently chosen by all of the participants, including high and low proficiency level participants. However, the distractor D) *whose* is relatively frequently chosen by all of the participants, especially low proficiency participants, though it is less frequently chosen by high proficiency participants. On the other hand, in Test Y, where the possible correct answer B) *whom* in Test X was replaced with distractor B) *which*, the correct answer A) was more frequently chosen by all of the participants, including high and low level participants. In turn, distractor B) *which* is much less frequently chosen by all of the participants, including high and low proficiency participants, even though *which* is presented relatively frequently presented as a distractor in Japanese university entrance exams. There is no difference between the percentages of the participants who chose distractor C) *what* in Test X and Test Y. However, distractor D) *whose* was slightly more frequently chosen by all of the participants, including high and low level participants. This is probably because many participants cannot understand the construction which contains a relative clause including an inserted clause and they exclude the relative pronouns *which* and *what* and judge only whether the antecedent is animate or inanimate.

5. Conclusion

As we have seen, I demonstrated that questions in Japanese university entrance exams testing the relative pronoun *who* used as a subject in an inserted clause are problematic because native speakers sometimes use

whom in such sentences. As the test analysis above shows, an alternative question, where *whom* is removed and replaced with another distractor, works well in terms of the item facility and the distractor analysis.

This research contributes to both corpus linguistics and language testing. In other words, the English used in the real world should be utilised in order to assess the quality of the English tested in the exams and could also be used to create questions. It is recommended that general corpora containing authentic English should be used to check the English presented in exams in order to ensure what questions only have a single correct answer.

Test developers need to be careful when considering the grammaticality of the examples presented in general corpora. Even written texts might contain 'grammatically incorrect' examples, though they are frequently used by native speakers. However, if such 'grammatically incorrect' cases occur frequently, then test developers need to carefully consider whether the aspect of language that they want to test is actually fair to test on learners. By slightly altering one part of the question, they could still produce a test item which can distinguish between different types of learners, but does not conflict with the experiences learners will encounter if they interact with native speakers.

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