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Adaptation and Validation of the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F) for Tertiary English Writing Courses in Japan

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Abstract

*Beyond language proficiency, the aim of writing courses for second-language learners of English is to develop a variety of skills collectively referred to as "critical thinking". Achieving this outcome is shown to be more likely among students that utilize high-level strategies for studying (**deep approach**) in contrast to those who apply the low cognitive approach of learning by rote (**surface approach**). In the present research, we explored the applicability of the revised two-factor Study Process Questionnaire (R-SPQ-2F) in evaluating the study approach engaged by students to accomplish a writing task. The participants were enrolled in a compulsory English writing course for science students at a Japanese university. Students were assigned to construct a scientific report in the Introduction-Methodology-Results-Discussion format based on an original experiment. The R-SPQ-2F was reworded to suit the writing task, translated into Japanese, and completed voluntarily by 210 participants – all were non-native speakers of English. Results of the analysis revealed reliability of the scales with Cronbach's alpha values of 0.883 for the deep approach and 0.899 for the surface approach. Confirmatory factor analysis using CFI and RMSEA indicate a good fit of the responses to the item parcel-based two-factor model. Work done here for adapting the R-SPQ-2F has resulted in a task-specific questionnaire that teachers can use for writing programs in the Japanese tertiary environment.*

Keywords: *academic writing, learning approach, R-SPQ-2F, scientific English, study process*

1. Introduction

The R-SPQ-2F [1], which is the simplified version of the Study Process Questionnaire (SPQ) [2], is an instrument utilized for evaluating students' learning environment. Based on the theory that engagement predicts learning success [3], the instrument evaluates whether a student learns by seeking meaning and linkages in the class materials (**deep approach**) or studies by rote (**surface approach**). The former approach is ideal for achieving the intended outcomes of a course [4] and is found to be promoted by implementing active learning – an approach widely applied in STEM courses (see [5] for review).

Academic writing courses have likewise implemented active learning to help students engage a deep approach and learn how to effectively write. Effective writing requires a set of skills (i.e., analyzing, perspective-taking and argumentation) that is commonly referred to as "critical thinking". Especially in the sciences, it is also necessary to observe a writing convention that is hallmarked by a formal tone, accuracy, objectivity, conciseness, and clarity, and is largely done in the *lingua franca* of science – English. In literature, the term "scientific English" has been coined to collectively refer to such conventions [6]. Authors, even those coming from non-native English speaking countries like Japan, observe the writing conventions of scientific English [7,8].

Tertiary course offerings that introduce academic writing in the sciences for non-native speakers of English have the tall order of concomitantly improving the students' critical thinking skills and their proficient use of scientific English. To increase the likelihood of success outcomes, teachers need instruments for assessing how students engage key course tasks, rather than rely on assessments administered at the end of the semester when it may be frustratingly too late to make adjustments. In the present study, we adapted and validated the R-SPQ-2F for its possible use as a tool for assessing the study approach engaged by students in accomplishing a scientific writing task.

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2. Method

2.1 Participants

The participants were first- and second-year students enrolled in a compulsory English writing course for science students at a Japanese university. All students were non-native English speakers. The course teaches the use of the scientific method in the design and conduct of an original experiment. Based on this, the students wrote a report in the Introduction-Methods-Results-Discussion (IMRD) format in English.

2.2 Adaptation of the Questionnaire

The Revised two-factor Study Process Questionnaire (R-SPQ-2F) [1] assesses students' approach to studying within the two-factor Deep and Surface Approach scales. Each of these main scales consisted of the motive and strategy subscales with each subscale consisted of five items. The items were reworded to assess the studying approach of the students to accomplish a scientific writing task (Table 1). The reworded items were then translated from English to Japanese by a bilingual Japanese native speaker and a non-native Japanese speaker. Another bilingual native Japanese speaker who was not directly involved in the study did a separate back-translation. The back-translations were compared with the original questions, and discrepancies were settled through consensus by all translators who were tertiary instructors. This process confirmed that the questions in Japanese embodied the original nature of the questions.

Table 1. Reworded R-SPQ-2F for assessing students' study approach to a scientific writing task.

DEEP APPROACH
Deep Motive
1. I find that at times writing the report using scientific English gives me a feeling of deep personal satisfaction.
5. I feel that writing virtually any research report using scientific English can be highly interesting once I get into it.
9. I find that writing the report using scientific English can at times be as exciting as a good novel or movie.
13. I work hard at writing the report using scientific English because I find the material interesting.
17. I come to most classes or visit support facilities (i.e. science laboratory, or writing support studio) with questions in mind about the report that I want answering.
Deep Strategy
2. I find that I have to do enough work on writing the report using scientific English so that I can form my own arguments before I am satisfied.
6. I find writing the report using scientific English interesting and often spend extra time trying to obtain more information about it.
10. I review the report several times until it reflects the concepts of scientific English.
14. I spend a lot of my free time finding out more about the use of scientific English to write the report.
18. I make a point of looking at many references to write the report.
SURFACE APPROACH
Surface Motive
3. My aim is to write the report while doing as little work as possible.
7. I do not find writing the report using scientific English very interesting so I keep my work to the minimum.
11. I find I can get by in the assessment by just writing in any way rather than trying to write the report using scientific English.
15. I find it is not helpful to study how to write the report using scientific English in depth. It confuses and wastes time, when all you need is a generic essay.
19. I see no point in deeply learning how to write the report using scientific English. I just have to write a generic essay.
Surface Strategy
4. I find that I do not need to do extra work to write the report using scientific English.
8. I blindly follow some of the rules for writing the report using scientific English and don't even bother trying to understand them.
12. I generally restrict my writing to what is specifically set as I think it is unnecessary to do anything extra.
16. I believe that teachers shouldn't expect students to spend significant amounts of time writing a report using scientific English since we do not need such skill in the near future anyway.
20. I find the best way to get a passing mark on the report is to just satisfy the minimum requirements.

This study forms part of a larger project that investigates the trajectory of student motivation in a tertiary academic writing course which was approved by the university's ethics committee. The R-SPQ-2F was conducted during the 11th week of class (total of 13 class weeks) and the students voluntarily responded to the questions on paper via a multiple response sheet designed by the authors. The accomplished multiple response sheets were digitized and the responses were extracted and converted to numerical values using the optical mark recognition software FormScanner [9]. Responses were stored separately and securely from any unique personal identification information. A total of 210 students (mean age = 18.4 ± 0.7; 13% female) completed the adapted and translated R-SPQ-2F.

2.3 Measures

The students recorded their responses to the adapted and translated R-SPQ-2F with a 5-point Likert-type scale of: 1 (*never or rarely true of me*), 2 (*sometimes true of me*), 3 (*true of me about half the time*), 4 (*this item is frequently true of me*), and 5 (*always or almost always true of me*).

2.4 Statistical Analysis

The task-adapted R-SPQ-2F was tested for reliability (Cronbach's alpha as an indicator) and confirmatory factor analysis was also done using CFI and RMSEA as indicators. All analyses were performed using SPSS Amos version 25.0.0.

3. Results

The reliability of the scales for the task-adapted R-SPQ-2F (Table 2) using Cronbach's alpha as an indicator was measured at both the sub-scales (i.e., DM, DS, SM & SS) and the main Deep and Surface scales. The alpha values ranged from 0.74-0.83 at the sub-scale level, which further improved to 0.88-0.90 at the main scales (Surface Approach and Deep Approach). At both levels, the internal consistency of the scales was acceptable since values ≥ 0.70 are desirable [10].

Table 2. Internal consistency of the subscales and overall scales of the task-adapted R-SPQ-2F using Cronbach's alpha as an indicator.

Scale	***No. of Items***	***Cronbach's Alpha***
Deep Motive (DM)	5	0.74
Deep Strategy (DS)	5	0.83
Surface Motive (SM)	5	0.82
Surface Strategy (SS)	5	0.79
Deep Approach (DM+DS)	10	0.88
Surface Approach (SM+SS)	10	0.90

Biggs et al. [1] initially hypothesized the R-SPQ-2F as a latent structure measured at the item level. However, their data showed a marginally acceptable fit to this model by confirmatory factor analysis using CFI and SRMR as indicators (Table 3). Arguing the occurrence of a Type II error for this, Biggs et al. [1] pursued an analysis using a model with parceled items (scale-based model), which substantially improved the values of their fitness indicators. The same pattern was also observed by Fryer et al. [11]. On the contrary, the data we retrieved using our task-adapted questionnaire fit both models very well, CFI = 1, RMSEA = 0.

Table 3. Goodness-of-fit indices to the hypothesized model at the sub-scales (item-based) and overall scales level (scale-based). For comparison, data of the reliability indices reported by Biggs et al. [1] and Fryer et al. [11] are listed.

Model	***CFI***			***RMSEA***		***SRMR***
	Present Study	**Biggs et al.**	**Fryer et al.**	**Present Study**	**Fryer et al.**	**Biggs et al.**
Item-based	0.825	0.904	0.78	0.10	0.063	0.058
Scale-based	1	0.998	1	0	0	0.015

Note: CFI = comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = standardized root mean squared residual

4. Discussion

We reworded and translated the R-SPQ-2F for use in assessing the study approach of students in the task of writing a scientific report in a Japanese tertiary academic writing course. The resulting task-adapted questionnaire, consistent with that of Biggs et al. [1], has the surface and deep approach as the main scales; each scale had 10 items which were equally divided between the motive and strategy sub-scales. The present study describes the successful adaptation of the R-SPQ-2F for assessing writing tasks in the sciences for non-native English speakers, which has not been reported elsewhere. Ellis et al. [14] has also previously reworded the R-SPQ-2F to assess the quality of student learning through writing in a biology course for native English speakers, but their analysis resulted in a low reliability of the surface approach scale (alpha = 0.69). The psychrometric properties of the Japanese version of our task-adapted questionnaire are better (Table 3), at the main scales level, than those previously reported for the R-SPQ-2F administered in English [1] or in Japanese [11]. These reports however, in contrast to our study, used the questionnaire to assess an entire course and not a specific task. The R-SPQ-2F appears to have increased effectiveness when adapted for a specific task. This is reminiscent of studies on the original SPQ (where the R-SPQ-2F was derived from) which had also been shown more sensitive when reworded to assess specific tasks [12,13]. Further, our results contribute to the body of knowledge supporting the multi-cultural applicability of the latent construct (that distinguish deep and surface processing) to describe students' task-specific learning approaches which can be applied in the context of tertiary academic writing courses in Japan. The task-adapted R-SPQ-2F we hereby developed is a short and simple instrument that teachers can use in designing science-focused writing tasks aligned with promoting a deep approach to learning.

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