Feature Presentation

Exploring IELTS Scores in an English for Academic Purposes Program Using Cluster Analysis

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We describe an investigation into individual differences in an English for Academic Purposes program. The aim is to explore characteristics of successful students in order to better support those less likely to succeed. Students' (N = 349) IELTS scores and survey responses were analyzed using cluster analysis. The survey concerned test preparation, prior test experience, and extrinsic motivation. Six subgroups with distinct characteristics were identified. Recommendations for program evaluation are made based on the findings.

English for Academic Purposes (EAP) is defined as "language research and instruction that focuses on the communicative needs and practices of individuals working in academic contexts" (Hyland & Shaw, 2016, p. 1). According to Jordan (2002), EAP is considered to be a key area within English for Specific Purposes (ESP). An important aspect of EAP programs for curriculum writers and teachers is formative evaluation of the program's objectives: are students achieving the learning goals, and why are some students more successful than others? Proficiency tests such as IELTS are often used to gauge students' academic English abilities after completing an EAP program. Many factors are involved in students' success on such proficiency tests, not the least of which are individual differences. The challenge for program heads is to tease apart these influences in

order to better support those learners who are less successful. Here, we describe an approach to identify patterns among students of a large cohort in order to determine whether a certain combination of factors can account for students' performance on IELTS, the program exit exam. The approach employs cluster analysis as a complementary analytical tool, which is easily adaptable in terms of the factors of interest to the program evaluation.

Cluster analysis is a multivariate procedure used to group people, as opposed to grouping variables as in factor analysis (Skehan, 1986). Measures are taken of a population sample on different variables, and based on patterns of scores on these variables, the sample is grouped into clusters of similar people (Skehan, 1986). Cluster analysis is often used to complement other traditional statistical procedures, as it can shed light on the role of individual differences that may not be readily apparent otherwise, as in Gu and Johnson's (1996) study on vocabulary learning strategies.

To investigate students' performance on the exit exam from our EAP program, we used cluster analysis as a complementary procedure to prior analyses (Erdelyi et al., 2018; Yagi & Fukuda, 2020), which had indicated much individual variation. This example analysis from our EAP program may be of interest to researchers seeking alternative approaches to program evaluation. Our research question is: what patterns among EAP program participants can be found in terms of IELTS test scores, test preparation, prior test experience, and extrinsic motivation?

Method

The data were collected from 349 first-year students at a Japanese university (n = 183 from the 2020 cohort and n = 166 from the 2021 cohort). Students join the EAP program in April, and after completing the program in February the following year, they take IELTS in March as an exit test to determine their academic English proficiency.

The data consist of two components: IELTS scores and responses to a survey. Table 1 shows the four 5-point Likert-scale items in the survey. They were drawn from our previous exploratory study (Yagi & Fukuda, 2020). The survey

aimed to ascertain how prepared, experienced, and motivated the participants were regarding the IELTS test. The responses to Item 1 and Item 2 were conceptualized as *preparation*. The responses to Item 3 represent *experience*, and those to Item 4 were *future use* (i.e., extrinsic motivation represented by the need for the test score in the future).

The IELTS scores ranged from 4.5 to 8.5 (M = 6.37, SD = 0.81). Since

Table 1

The Question Items and the Options in the Survey

Item 1	How many hours did you study to prepare for the IELTS exam?
	More than 10 hours Between 5 and 9 hours Between 2 and 5 hours Between 1 and 2 hours None
Item 2	Did you participate in the information sessions for IELTS held at Guidance Seminar in December and Preparation Seminar in January?
	Both days January only December only Part of one day
Item 3	Had you taken IELTS before you took it in March?
	4 or more times 3 times 2 times 1 time Never
Item 4	How likely are you to use the IELTS results to study abroad in the near future, such as on an exchange program or graduate school?
	Very likely Quite likely Somewhat Not very likely Not at all

test scores and responses to survey items were used in the analysis, all data were standardized to z-scores. To answer the question of what patterns can be identified among participants, the data were analyzed employing cluster analysis with four factors explained above. The cluster analysis was conducted following the procedure in Staples and Biber (2015).

Results

As a result of the cluster analysis, the participants were categorized into six groups, which are shown in Figure 1. ANOVAs were conducted to confirm the validity of this six-group solution: the groups were significantly different in all four factors ($p < .001$), and the effect sizes were medium to high (.49 to .69 in eta squared).

The results from the analysis found that the six clusters of participants have the following characteristics. Cluster 1 ($n = 16$) were most experienced with the test. They did not prepare much, and their IELTS scores were above average. Cluster 2 ($n = 50$) reported the lowest need for the test scores in the future. They prepared less than average, and their scores were low. Cluster 3 ($n = 65$) had an average need for the test score in the future. However, they did not prepare for

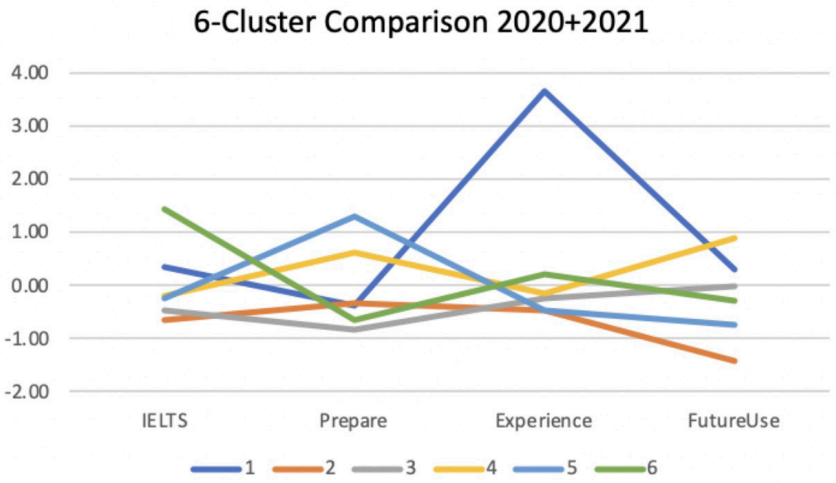

Figure 1. Six-cluster comparison 2020+2021

the test, and their scores were low. Cluster 4 (n = 123) had the most interest in using the score for the future. They prepared, but their scores were below average. Cluster 5 (n = 33) prepared the most, but the scores were below average. Their interest in using the score for the future was also below average. Cluster 6 (n = 62) had the highest scores but prepared less than average. Their test experience was just above average.

Discussion

As noted above, cluster analysis is an exploratory tool, and the findings can raise unexpected insights into the participant group (Staples & Biber, 2015). Here, we focus on three such observations among the clusters, which we will explore in future research.

First, we are interested in exploring further the effect of test experience on test scores. For example, Clusters 1 and 6 had the most experience, scored the highest, and prepared the least. This finding suggests that test experience may be more valuable than attending test information sessions before test day. Currently, there is no specific IELTS test preparation course available to the majority of these students before the exam, and yet having practical test experience seems to be helpful. Opening test prep courses is, therefore, an important consideration for the EAP program heads.

Secondly, we need to look further at the interaction between motivation and test preparation. For example, Clusters 2 and 5 both reported the lowest future need for the score (i.e., extrinsic motivation), yet Cluster 5 prepared the most for the test of all groups. It was unexpected that students with low extrinsic motivation would prepare a lot for the test. Thus, we need to further refine the factor of motivation for the purposes of the program evaluation analysis.

Lastly, we found that the factors of test experience, test preparation, and extrinsic motivation were not sufficient to explain the differences in test scores between all the participants. When we look at Clusters 3 and 6, these two groups seem to show similarities in terms of average test experience, below average test preparation, and an average need for the test in the future. However, in terms of test scores, Cluster 3 scored below average while Cluster 6 scored well above

average. What this suggests is that there are factors beyond those examined in this analysis that need to be explored to account for differing test performance.

Conclusion

Cluster analysis can be a useful complementary statistical tool for EAP program evaluation, as it attempts to group participants according to patterns of factors chosen by the researcher. This can bring to light individual differences that are not obvious through traditional analyses. Our findings have indicated several ways that the program heads can better support students in the exit exam process. For example, we found that some students identified a need for the test score, yet did not prepare much for the exam. Thus, we recommend making test prep courses available to these students before they sit the exam. We also found that having test experience was more valuable than attending the test information sessions. Again, this highlights the need for focused test preparation courses in which students can get hands-on experience with the IELTS format. Finally, we were not able to collect program entrance test scores due to Coronavirus restrictions. Our future program evaluations will include a comparison of entrance and exit test scores, as well as fine tuning complex factors such as motivation.

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