Cluster Analysis to Compare Learner Characteristics
in English Courses of General Education

Pornsin Supawan[1] / Intira Charuchinda[2*]

[1]Assistant Professor, Mathematics Department, Faculty of Science and Technology,

Phranakhon Rajabhat University

[2]Associate Professor, English Language Department, Faculty of Humanities and Social Sciences,

Phranakhon Rajabhat University

[*]Corresponding author's email: limsongprot@gmail.com

Abstract

Understanding learner characteristics can guide educators in providing appropriate support to meet individual needs which can lead to learning achievement. This research aimed: 1) to cluster students by grades earned from English courses of General Education (GE) at a government university using cluster analysis, and 2) to compare the learner characteristics across different achievement levels by focusing on four learner characteristics, i.e. (1) motivation and attitudes, (2) student engagement, (3) test preparation and test taking behaviours, and (4) Classroom participation. A sample of 400 individuals was derived through cluster sampling. The research instrument was a questionnaire. The data were statistically analyzed by using frequency, mean, standard deviation, K-means cluster analysis, MANOVA, ANOVA, and Bonferroni. The findings were as follows. 1) Using K-means cluster analysis to cluster student achievement levels as indicated by grade point averages of the two GE English courses, it found three clusters: high achievers, moderate

achievers, and low achievers. 2) Concerning comparisons of learner characteristics, it found that motivation and attitudes, learning engagement, and test preparation and test taking behaviours of the high achievers were significantly higher than those of the moderate and low ones. However, it found no statistically significant difference between the learner characteristics of the moderate achievers and those of the low ones. Remarkably, statistically significant differences in classroom participation of all the three clusters were not found.

Keywords: cluster analysis, learner characteristics, second language acquisition

Introduction

      Second language learners vary on a number of parameters. It is clear that there are certain characteristics held in common by effective second language learners. Such learners make satisfactory progress while other learners seem to make much less progress. This has led scholars to attempt to identify characteristics or behaviours associated with successful second language acquisition. It finds that learner characteristics can be widely different among different learners. De Koning, Loyens, Rikers, Smeets, and Molen (2012) study literature about learner characteristics and summarize that a large number of learner characteristics are known to be significantly related to academic achievement.

      Although numerous studies have investigated learner characteristics such as motivation and attitudes, student engagement, test preparation and test taking behaviours, and classroom participation, each study has tended to confine itself to just one of these characteristics or to a limited group of them. The researchers found few documented studies which have examined the correlations between multiple

characteristics together in relation to student achievement levels in learning English. An insight of multiple learner characteristics can help educators tailor their teaching methods and strategies to meet the diverse needs and preference of their students and create a more inclusive and effective learning environment for all learners.

The general education (GE) program at a Thai government university requires students to take two compulsory courses i.e., *English for Everyday Communication* and *English for Study Skills Development*, in recognition of the importance of the English language. These two GE English courses aim to equip students with communication study skills, which are necessary skills for lifelong learning.

In this light, comparisons across different levels of English achievement on multiple learner characteristics, namely motivation and attitudes, student engagement, test preparation and test taking behaviours, and classroom participation, in the context of the government university can help those involved create learning experiences in consonance with learner characteristics and empower students of different levels of achievement to learn at best of their potential.

Research Objectives

The study aims 1) to compare students by their academic achievements in the GE English courses at the government university based on k-means cluster analysis, and 2) to compare the learner characteristics across the clusters of different achievement levels.

Hypothesis. Learner characteristics, namely motivation and attitudes, student engagement, test preparation and test taking behaviours, and classroom participation are significantly and positively associated with the achievement levels at significance level of .05.

Related Literature Review

Learner characteristic is a broad concept. Drachsler and Kirschner (2011) note that learner characteristics can be personal, academic, social/emotional, and/or cognitive in nature. In this regard, learner characteristics are heterogenous. This study confines itself to four characteristics about which a review of the relevant literature is briefly presented as follows:

1.Motivation and attitudes. Motivation is a multidimensional construct and involves an attitudinal aspect which plays a crucial role in language learning and directly influences learners' behaviours towards achievement (Gardner, 1985). According to Ellis (1995), the distinction between motivation and attitudes are not always clear-cut. The relationship between learning achievement and motivation has been widely documented, leading to a conclusion that regardless of subject matter, students with a high level of motivation tend to achieve better academic results, get a deeper understanding, feel more satisfied with their results, and strive for greater success (Arkhipova, Belova, & Shutova, 2017). In this study, this aspect incorporates students' acknowledgement of the importance of the English language, desire for success in learning English, devotion to learning English, enjoyment in learning English, motivation to learn English for self-development, motivation to learn English for global communication, motivation to learn English for their jobs or future, and motivation to learning English for academic purposes.

2.Student engagement. This term is often understood as the ability to motivationally and behaviorally engage in an effective learning process. Astin (1999) defines student engagement as the amount of physical and psychological energy that a student devotes to the academic experience. In the same vein, Trowler (2010) says that it is the interaction between the time and effort invested by both

students and their institutions. Some writers define student engagement as time and effort students devote to learning activities that are linked to desired outcomes (Berliner, 1990; Kuh, 2009). In this present study, the student engagement means the degree of active involvement in classroom activities, learning technique employment, notetaking, reviewing lessons learned from the class, asking teachers when having queries, and learning English by themselves.

       3. Test preparation and test taking behaviours. The term 'test preparation' refers to the length of time the student invests in studying for a test, which could be reading, copying notes, quizzing with a partner (querying), or practising test elements (Bleidorn, 2012). It typically involves independent reading and activities that support independent reading, which are usually under the direction of the teacher (Broekkamp & Hout-Wolters, 2006). In this present study, it refers to students' preparation before tests or exams, effort to review lessons after the class on their own, participation in tutorial groups before tests or exams, attention paid to the teacher when the teacher gives test guidelines, time spending on checking their answers before submission, and readiness to comply with testing regulations.

       4. Classroom participation. There have been a number of previous studies attempting to define classroom participation. For instance, Vandrick (2000) says that for most teachers, it means students speaking in class, asking questions, making comments, and joining discussion. Fritschner (2000) describes participation in terms of talkers who prefer speaking out in class, and non-talkers who participate through attendance, active listening, sitting in their seats, doing the assignments, and being prepared for class. In contrast, Dancer and Kamvounias (2005) broadly define it as an overall engagement process whereby students prepare, contribute to discussions, develop group skills and communication skills and attend the class. Previous studies

reveal a positive relation between students' in-class participation and academic achievement (Kim, Shakory, Azad, Popovic & Park, 2019). Tatar (2005) finds that active classroom participation plays a crucial role in the success of education and students' personal development in the future. In this study, classroom participation is broadly defined as playing an active role in all in-class activities such as brainstorming activities, games, quizzes, discussions, and surveys in-class.

In sum, the conceptual framework underpinning in this study supposes that it might be significant to investigate all these learner characteristics across different levels of achievement. The assumption of this study is that students of different achievement levels are likely to exhibit different characteristics.

Research Methodology

Study Context. This study concerns students at a government university in Thailand with the important mission to provide education for all students so that they can become effective citizens of the country. Therefore, the university's admission standards are not as competitive as those of traditional universities. The university's students are from Bangkok and other parts of the country, of diverse social standings. In addition, a large number of students have part-time jobs. Although, this study did not ask the respondents about their English scores on the national entrance exam, it could be assumed that students who did not do well would go to this government university.

The learning management of these two GE courses is described as follows. The students took the course of *English for Everyday Communication* before the course of *English for Study Skills Development*. Students who took these courses were usually in their first and second years at university. Each course ran for sixteen

sessions (or weeks), and each session lasted 3 hours. Commercial textbooks accompanied by audio/video materials and online exercises are used. In each class, there were 40-60 students. They may have had different levels of English proficiency and study different disciplines. As for the mark allocation, classroom participation had a weighting of 20 percent of the total score, and the midterm test and the final exam a weighting of or 50 percent. The remaining 30 percent was assigned to tasks.

Population and sampling. This study was conducted with a population of 13,312 undergraduates comprising non-English majors and non-international college students. They were in their second, third, and fourth years of study. At the time of this survey, they had completed the two GE English courses i.e., *English for Everyday Communication* and *English for Study Skills Development.* The sample derived through cluster sampling comprised 400 students who were asked to complete a self-report questionnaire. In this event, 340 respondents filled in and returned it correctly and completely, giving a response rate of 85.0 percent.

Instrumentation. The research instrument was a self-report questionnaire, comprising three parts. Part I was designed to collect demographic information. Part II was to collect data about learner characteristics which they held while they were taking these two English courses. It featured a five-point Likert's scale ranging from 'very high' to 'very low.' Part III was an open-ended question asking them to report their characteristics or behaviours while taking these two courses.

The instrument was validated by three experts in English language teaching, and the agreement between the contents and the research objectives were taken into consideration. The researchers revised the questionnaire according to the experts' advice before testing on a pilot sample of 30 individuals who were not involved in this study in order to check whether they could understand the language use in the

questionnaire. Then the researchers revised the language. Later, the researchers used Cronbach's Alpha Coefficient to identify its overall reliability and found that its reliability of the whole questionnaire was 0.910, thus suggesting a very high level.

The mean values were interpreted according to Best (1997) as follows: 4.50 – 5.00 representing very high, 3.50 – 4.49 representing high, 2.50 – 3.49 representing middle, 1.50 – 2.49 representing low, and 1.00 – 1.49 representing very low.

Data Collection. The respondents were informed about the purpose of this research and assured that their responses would be kept confidential. After having received the copies of the questionnaire, the researchers examined the completeness of each copy, encoded and entered the data into a statistical software package.

Statistical Analysis. Part I, which elicited demographic information from the respondents, was analyzed by using frequency and percentage. Part II asking their characteristics was analyzed by using mean and standard deviation. Part III asking about their characteristics was analyzed by using frequency. K-means cluster analysis was used to group students into clusters based on the average of their grades gained from the two GE English courses. Also, MANOVA, ANOVA, and Bonferroni were used to compare characteristics across the levels of achievement.

Results

Demographic Information. A little over the half (52.1 percent) of the respondents were female. Just a little less than a half (43.8 percent) were third year students. About two fifths or 39.7 percent studied in the Faculty of Management Science. About two thirds or 64.1 percent did not work part-time. The majority (82.4 percent were full-time students.

Characteristics of Each Cluster. Using K‑means cluster analysis, the researchers classified the respondents into three clusters based on their average of the grades earned from the two GE English courses, namely high achievers, moderate achievers, and low achievers. The description is displayed in Table 1.

Table 1

Description of the Characteristics of Each Cluster

Cluster	High (*n* = 116)		Moderate (*n* = 136)		Low (*n* = 88)	
	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
Grade average earned from the two courses*	3.09	0.34	2.22	0.21	1.32	0.35
Characteristic**						
Attitudes and motivation	3.70	0.52	3.51	0.48	3.38	0.60
Student engagement	3.53	0.70	3.24	0.50	3.16	0.82
Test preparation and test taking behaviours	3.59	0.60	3.31	0.60	3.17	0.79
Classroom participation	3.64	0.93	3.57	0.78	3.48	0.87

* The grade is calculated on a 4.0 scale.

** The characteristics are reported, using a five-point scale.

The Comparison of Learner Characteristics Across the Three Clusters. A multivariate analysis of variance (MANOVA) was performed to simultaneously compare the three clusters of students ‑ partitioned by their achievements gained from the two English courses ‑ across all the four characteristics. A significant difference among the three clusters of which the *p*-value was .000 shows in Table 2.

Table 2

MANOVA Results Showing the Overall Comparison of Learner Characteristics across the Three Clusters

Independent Variable	Wilks' Lambda	Multivariate F	p-value
Cluster	0.902	0.354	.000

The more precise details, as viewed in Table 3, show that respondents of different achievement levels had three different characteristics with p-value of .000. These three are: 1) motivation and attitudes, 2) student engagement, 3) test preparation and test taking behaviours. Meanwhile, no statistically significant difference in classroom participation among the three clusters was detected, for p-value was .410.

Table 3

ANOVA Results Showing the Learner Characteristics of Each Cluster

Learner Characteristic	*Type III SS*	*df*	*MS*	*F*	*p*-**value**
Motivation and attitudes	5.351	2	2.675	9.638	.000
Student engagement	8.147	2	4.073	9.250	.000
Test preparation and test taking behaviours	9.574	2	4.787	11.136	.000
Classroom participation	1.315	2	0.658	0.894	.410

The multiple comparison by using Bonferroni's method to identify the difference in motivation and attitudes of each pair among the three clusters reveals that this characteristic of the high achievers was significantly higher than that of the

other two clusters. But there was no difference between that of the moderate achievers and that of the low achievers at the significance level .05, as illustrated in Table 4.

Table 4

Multiple Comparisons of Motivation and Attitudes

Level of Achievement	$\overline{X}$	High	Moderate	Low
High	3.70	-	0.19*	0.32*
Moderate	3.51		-	0.13
Low	3.38			-

*$p < .05$

      The multiple comparison by using Bonferroni's method suggests a significant difference in student engagement, with high achievers reporting this particular characteristic higher than the moderate and low achievers at the significance level .05. Meanwhile, there was no significant difference between that of the moderate achievers and that of the low achievers as shown in Table 5.

Table 5

Multiple Comparisons of Student Engagement

Level of Achievement	$\overline{X}$	High	Moderate	Low
High	3.53	-	0.29*	0.37*
Moderate	3.24		-	0.08
Low	3.16			-

*$p < .05$

When the Bonferroni's method was employed to detect whether there was any significant difference in test preparation and test taking behaviours of each pair among the three clusters, it finds that this very characteristic of the high achievers was significantly higher than that of the other two clusters. However, there was no significant difference between this particular characteristic exhibited by the moderate achievers and that by the low achievers, as presented in Table 6.

Table 6

Multiple Comparisons of Test Preparation and Test Taking Behaviours

Level of Achievement	$\overline{X}$	High	Average	Low
High	3.59	-	0.28*	0.42*
Average	3.31		-	0.14
Low	3.17			-

*$p < .05$

Discussion

This research has studied undergraduates' grades earned from the two GE English courses at the government university, using cluster analysis, and examined learner characteristics across three different clusters of achievements in the two GE English courses. The results shows that in general the different levels of achievements were associated with learner characteristics, namely in motivation and attitudes, student engagement, and test preparation and test taking behaviours. Meanwhile, a significant difference in classroom participation among the three clusters was not detected. The findings of this study can be discussed as follows:

Motivation and attitudes. This current study finds the high achievers had significantly higher motivation and attitudes towards learning English than the moderate and low achievers. Similarly, the moderate achievers had higher motivation than the low ones, on average. These results are consistent with the previous studies of this aspect. For example, Thang, Ting, and Jaafar (2011), who studied motivation in learning English of Malaysian secondary students, find that the better students have more positive attitude towards learning English.

Student engagement. The study finds that student engagement demonstrated by the high achievers was significantly higher than that by the moderate and low achievers. In the same way, the moderate achievers had better student engagement than the low ones, on average, but not at a statistically significant level. In particular, the high achievers tended to involve themselves in classroom activities, have their own learning techniques, study the contents before participating in the class, ask teachers when having queries, take note during the class, review lessons learned from the class, and learn the English language by themselves. This finding confirms previous research. Kirsch, Jong, LaFontaine, McQueen, Mendelovits, and Monseur (2002) found that student engagement had the largest correlation with achievement in reading literacy. Also, Skinner and Pitzer (2012) writes that student engagement was a powerful predictor of learning achievement, retention, and graduation.

Test preparation and test taking behaviours. It finds that students of different levels of achievement differed in their test preparation and test taking behaviours. The high achievers reported this characteristic significantly higher than the moderate and low achievers. No significant difference in this characteristic between the moderate achievers and low ones was detected. The findings on this aspect largely replicate a previous study by Kitsantas (2002), who found that high test scorers used

more self-regulatory processes to enhance test preparation and performance, and self-regulation positively affected performance.

Classroom participation. A statistically significant difference in classroom participation held by the three clusters was not found. However, the non-significant findings may hint towards something significant. That is to say, some elements of classroom practices need to be taken into account.

One possible explanation lies in the widespread use of ICT tools. This might have played down the importance of physical presence in the classroom, for it provided students with opportunities to learn inside as well as outside the classrooms.

Moreover, the implementation of large class teaching might have affected students' classroom attention. These two GE English courses were taught in big classes with 50-70 students lumped together, regardless of their level of English proficiency or area of study. Such practice might have frustrated the teacher's attempts to remember the names of all students, to call them to answer the questions in the class, and to give them individual attention. Cooper and Robinson (2002) note that large EFL classes often make students feel less personal responsibility for learning, have less motivation to learn, and attend class less often.

In addition, learning activities in large classrooms with a diversity of English proficiency among the students might not help all students make progress at their own pace. This classroom can make some students not actively participate in the class. Some of the content knowledge in these two GE courses might have been already taught at the level of secondary education. The high achievers might have had more prior knowledge than the moderate and low achievers. Moreover, the low achievers might have been unable to catch up with the class. The students with high English proficiency may get bored with the teacher's instruction when the teacher

tries to explain contents to the students with moderate and low levels of English proficiency. Hedge (2000) says that failure by the teacher to respond to the needs of every student makes the active learner maintain their active state whereas the passive learners remain passive, making no progress in learning.

Also, the assessment of classroom participation was primarily based on their presence in the class, rather than their active participation. What students might have cared about most was to manage to answer the teacher when s/he called their names on the long list to check their presence. This practice might not have encouraged students of different levels of achievement to enthusiastically participate in the class.

Additionally, it is possible that the other characteristics of the high achievers such as motivation and attitudes, student engagement, and test preparation and test taking behaviours, where they were reported at significantly high levels in this study, might have worked together to affect their achievement. Apart from the learner characteristics covered in this study, the high achievers might have possessed other positive characteristics facilitating language achievement which are not included in this study. It is clear that plenty of factors affect academic achievements.

Recommendations

There is no statistically significant difference between the classroom participation across the three clusters. An interesting finding is that the four characters self-reported by the high achievers, namely motivation and attitudes, student engagement, and test preparation and test taking behaviours were significantly higher than the other two clusters. These characteristics reported by the moderate and low achievers were not significantly different. These findings agree with a common truth that academic success requires persistent effort and passion.

Pedagogical Implication. The findings of this study reinforce the idea that multiple learner characteristics have an effect on second language acquisition. According to these findings, teachers need to accept the heterogeneity of their learners by increasing students' motivation and building positive attitudes towards learning English, engaging students in meaningful and interesting activities, and helping them prepare for tests and examinations. Moreover, this study invites us to think about the importance of classroom participation, for it finds that in this academic setting, classroom participation does not significantly relate to students' achievement levels. To improve student classroom participation, it is advised that teachers should give special attention to students with low English proficiency.

Recommendations for Further Studies. Although this study has provided an insight into multiple learner characteristics in relation to their English achievement levels, it has covered only four characteristics. To overcome this shortcoming, it is important to study other learner characteristics or external factors. Also, this study employed a quantitative study method, merely relying on a self-report questionnaire as a research instrument. Thus, qualitative research methods should be performed in order to understand learners more accurately. In addition, the present study involves only students in EFL classes at a government university. Its findings are not always generalizable across different contexts. Thus, it might be a good idea to examine characteristics in other educational institutions. Last, the students' grades used as data in this study do not solely rely on test scores but on a combination of various components, such as classroom attendance, assignments, presentations, and perhaps "brownie points" awarded fortuitously. Such data may not always have corresponded to students' achievements. Hence, students' success measured by merely language achievement tests may be considered in further research.

References

Arkhipova, M. V., Belova, E. E., & Shutova, B. N. (2017). On motivation of learning as English as a foreign language: Research experience in Russian university context. In A. Filchenko, & Z. Anikina (Series Eds.), *Linguistic and Cultural Studies: Traditions and Innovations: Vol 677. Advances in Intelligent Systems and Computing*, 113-121. http://doi.org/10.1007/978-3-319-67843-6_14

Astin, A. W. (1999). Student involvement: A developmental theory for higher education. *Journal of College Student Development, 40*(5), 297-308.

Berliner, D. C. (1990). What's all the fuss about instructional time? In M. Ben-Peretz, & R. Bromme (Eds.), *The nature of time in schools: Theoretical concepts, practitioner perceptions*, 3-35. Teachers College Press.

Best, J. W. (1997*). Research in education.* Englewood Cliffs. Prentice-Hall.

Bleidorn, W. (2012). Hitting the road to adulthood: Short-term personality development during a major life transition. *Personality and Social Psychology Bulletin, 20*(10), 1–15. 113-121. http://doi.org/10.1177/0146167212456707

Broekkamp, H., & Hout-Wolters, B. (2006). Students' adaptation of study strategies when preparing for classroom tests. *Educational Psychology Review. 19*(4). 401- 428. 113-121. http://doi.org/10.1007/s10648-006-9025-0

Cooper, J., & Robinson, P. (2002). The argument for making large classes seem small. *New Directions for Teaching and Learning, 2000*(81), 5-16. http://doi.org/10.1002/tl.20504

Dancer, D., & Kamvounias, P. (2005). Student involvement in assessment: A project designed to assess class participation fairly and reliably. *Assessment & Evaluation in Higher Education, 30*(4), 445-454.

De Koning, B. B., Loyens, S. M. M., Rikers, R. M. J. P., Smeets, G., & Molen, H. T. (2012). Generation Psy: Student characteristics and academic achievement in a three-year problem-based learning bachelor program. *Learning and Individual Differences, 22*(3), 313-323.

Drachsler, H., & Kirschner, P. A. (2011). Learner characteristics. In N. M. Seel, (Ed.), *Encyclopedia of the Sciences of Learning.* Springer. http://doi.org/10.1007/978-1-4419-1428-6_347

Ellis, R. (1995). *Understanding second language acquisition*. Oxford University Press.

Fritschner, L. M. (2000). Inside the undergraduate college classroom: Faculty and students differ on the meaning of student participation. *The Journal of Higher Education, 71*(3), 342-362. http://doi.org/10.2307/2649294

Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation.* Edward Arnold.

Hedge, T. (2000). *Teaching and learning in the language classroom.* Oxford University Press.

Kim, A. S. N., Shakory, S., Azad, A., Popovic, C., & Park, L. (2019). Understanding the impact of attendance and participation on academic achievement. *Scholarship of Teaching and Learning in Psychology, 6*(4), 272-284. http://doi.org/10.1037/stl0000151

Kirsch, I., Jong, J., LaFontaine, D., McQueen, J., Mendelovits, J., & Monseur, C. (2002). *Reading for change: Performance and engagement across countries result from PISA 2000.* Organization for Economic Co-operation and Development.

Kitsantas, A. (2002). Test preparation and performance: A self-regulatory analysis. *The Journal of Experimental Education, 70*(2), 101–113. http://doi.org/10.1080/00220970209599501

Kuh, G. D. (2009). What student affairs professionals need to know about student engagement. *Journal of College Student Development, 50*(6), 683–706. http://doi.org/10.1353/csd.0.0099

Skinner, E. A., & Pitzer, J. R. (2012). Developmental dynamics of student engagement, coping, and everyday resilience. In S. L. Christenson, A. L. Reschly & C. Wylie (Eds.), *Handbook of research on student engagement*, 21-44. Springer.

Tatar, S. (2005). Why keep silent? The classroom participation experiences of non-native-English-speaking students. *Language and Intercultural Communication, 5*(3-4), 284-293.

Thang, S. M., Ting, M., & Jaafar, N. M. (2011). Attitudes and motivation of Malaysian Secondary students towards learning English as a second language: A case study. *3L: The Southeast Asian Journal of English Language Studies, 17*(1), 40-54.

Trowler, V. (2010). Student engagement literature review. *The Higher Education Academy.* https://www.advance-he.ac.uk/knowledge-hub/student-engagement-literature-review

Vandrick, S. (2000). *Language, culture, class, gender and class participation.* Paper presented at TESOL Annual International Convention, Vancouver, Canada. https://eric.ed.gov/?id=ED473086

Authors

Pornsin Supawan

Mathematics Department, Faculty of Science and Technology

Phranakhon Rajabhat University

Tel: 063-235-4292 Email: pornsin.s@gmail.com

Intira Charuchinda

Corresponding author

English Language Department, Faculty of Humanities and Social Sciences

Phranakhon Rajabhat University

Tel: 097-2954995 Email: limsongprot@gmail.com