

RESEARCH ARTICLE

Open Access



# Exploring language needs of college transfer students with learning analytics: towards a more equitable experience

Dennis Foung<sup>1\*</sup> , Julia Chen<sup>2</sup> and Kin Cheung<sup>2</sup>

\*Correspondence:  
dennis.foung@gmail.com

<sup>1</sup>The University of British  
Columbia, Vancouver, Canada

<sup>2</sup>The Hong Kong Polytechnic  
University, Hung Hom, Hong  
Kong

## Abstract

College transfer students are those who follow a different trajectory in their higher education journeys than traditional students, completing a sub-degree before pursuing a bachelor's degree at a university. While the possibility of transferring makes higher education accessible to these students, previous studies have found that they face various challenges, from issues with course load to language challenges. This study aims to examine (1) the critical factors contributing to the success of transfer students in a language course; and (2) how transfer students perform better or worse than those who enter university directly. This study conducted learning analytics with 700 college transfer students in Hong Kong, retrieving their demographic and learning data from the learning management system and the university academic registry. The results suggest that English exam scores, current semester GPA, graduating GPA at community college and current course load are important predictors of transfer students' success in language courses. This study also finds that transfer students have lower levels of language proficiency than direct entrants. It concludes with specific recommendations to make higher education more accessible to transfer students and suggestions on how to use learning analytics to track students with different trajectories.

**Keywords:** Learning analytics, College transfer students, Transfer shock, Classification tree, Senior year admitted students

## Introduction

### The unique trajectories of college transfer students

Generally, college transfer students are those who complete a two-year sub-degree at a community college and then proceed to enrol in a four-year bachelor's degree program at a university (Monaghan and Attewell, 2015). Unlike students who enter a bachelor's degree program at university from high school, these students have adopted a non-traditional trajectory to obtaining a bachelor's degree at a university, which is believed to bring graduates advantages in their careers and lives. In Hong Kong, students are increasingly taking advantage of this new education pathway (Concourse on Self-financing Post-secondary Education, 2017). While transferring

makes university education more equitable, there is a chance that they will leave the program without obtaining a degree (Cabrera et al., 2005). Therefore, it is important to examine ways to better monitor and support college transfer students so this practice can facilitate equity.

### **General equity issues with college transfer students**

Even though transferring makes education accessible to students who may otherwise not have access to a university degree, research suggests that universities may not be as inclusive as possible. Past studies have identified several key issues. First, college transfer students may suffer from “loss of credits”, meaning that the credits they completed for their sub-degree are not transferred to the receiving institution (Giani, 2019). The key implication is that transfer students end up taking more courses to meet university requirements so they can graduate on time. With the credit-based tuition fee system adopted by universities, taking more courses also has monetary implications, which can affect low-income students. Second, students face various challenges that are collectively referred to as “transfer shock” in the earlier (Hills, 1965) or more recent studies (Wong, 2019). These challenges can range from managing new relationships with peers and faculty members (Archambault, 2015; Holland Zahner & Harper, 2022) to receiving conflicting information (Robison et al., 2020). Third, another key challenge is the prevalence of English as a second language students among college transfer students. Studies have found that transfer students lack the confidence that they have the English proficiency to complete a university degree. Other studies have found that some sub-degree programs spend time equipping students with source-based writing skills (Pullen, 2019), which are important to academic literacy, but they do not have enough time to fully polish their language skills (Frodesen, 2015). Foung and Cheung (2022) also reported that students lack the disciplinary vocabulary to learn effectively in a university setting, which is echoed by Wu and Lau (2021). Lin and Yi (1997) believe that these problems become barriers for transfer students to learn effectively in their other courses. More importantly, this can become especially problematic as students with lower levels of proficiency are required to take remedial English courses in addition to their other academic courses. It is necessary to find out more about how language learning and proficiency make university programs more (or less) accessible to transfer students.

Despite the major challenges faced by these students, recent studies have begun to re-examine the issues and see whether their previous experience may also benefit them. For example, Wu and Lau (2021) believes that college transfer students are more mature and have greater cognitive power than traditional students, so they can handle the courses in their disciplines well despite their lower language proficiency. Cheung and Foung (2021) re-examined “transfer shock” and concluded that some challenges may actually be advantages. For example, transfer students have the study skills needed to handle course readings they do not understand; they are accustomed to handling such difficult readings in their sub-degree studies. While this is encouraging, further research is necessary to understand the factors that contribute to course success, especially those related to language learning and proficiency.

### **Studies using LA to support students with different trajectories/promote equity**

As challenges have been reported in studies for decades and an increasing number of students are now following this non-traditional educational trajectory, it is unsurprising that many studies have adopted a qualitative approach. For example, some did surveys (O'Connell and Resuli 2020) or interviews (Buenaflor et al., 2022) with college transfer students, while Wu and Lau (2021) interviewed faculty members to understand their needs. These studies built a strong foundation for understanding the challenges faced by college transfer students, but a more general picture is lacking.

Some recent studies have adopted a learning analytics (LA) approach to understand equity and accessibility issues in higher education for college transfer students. Learning analytics, in general, refers to “the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs” (Long & Siemens, 2011, p. 32). Learning analytics can be understood as a general field of interest that covers “academic analytics” and “learning analytics” with the former focusing on institutional level, e.g. learner profile/academic success, and the latter on course-level/learning process, e.g. relationship between learning content, learner and teachers (Long & Siemens, 2011). More recent literature further classified learning analytics based on the intended use (Zilvinskis et al., 2017). With the emergence of digital learning environments, which have been adopted by most universities, Siemens (2012, as cited in Moon et al., 2023) suggests that learning analytics can assist in the “analysis and prediction of students’ learning trajectories” (p. 2). To a great extent, this line of research on learning trajectories falls into the notion of “academic analytics” as learning trajectories are directly related to learner profile. Some common themes in these academic analytics studies are the use of empirical student data from their community colleges (Nadasen & List, 2017) or national surveys (Zilvinskis & Dumford, 2018). The objectives of these studies have included predicting transfer students’ engagement (Zilvinskis & Dumford, 2018), credit loss (Giani, 2019), degree completion (McDonald, 2020; Zhang, 2022), first-term GPA, re-enrollment and retention (Nadasen & List, 2017). While the academic analytics with a focus on institutional factors is very different from learning analytics that focus on learning, this paper will still use “learning analytics” to refer to the analytics being conducted in this study.

While these studies have examined transfer students’ success using community college and receiving institution data, few have used data to analyse their success in individual courses. Among the many predictors of college success, some include demographic factors (Zhang, 2022), completion of remedial English/mathematics courses (Nadasen & List, 2017), community college GPA and course load (McDonald, 2020). These factors were within the scope of past studies. In particular, Nadasen and List (2017) argued that the number of community college credits accepted by the receiving institution has a significant impact on the success of transfer students, especially in STEM disciplines. When fewer credits are accepted by the receiving institution, students need to take more courses at university, which can have a negative effect on degree completion. McDonald (2020) noted that transfer students who achieve a higher grade point average (GPA) at community college have a higher rate of success at university. Nadasen and List (2017) also found that completion of

English and mathematics courses are significant predictors of a student's first-term university GPA.

Despite the success of these studies, larger-scale analytics-based studies are limited. Most importantly, while studies have identified that transfer students need to be proficient in English and the implications of the completion of English courses (Nadasen & List, 2017), few have explored how different factors contribute to transfer students' success in English courses.

### **College transfer students in Hong Kong**

In Hong Kong, high school graduates can continue their studies full-time through four pathways: direct entry to a bachelor's program, the "2+2" articulation pathway, vocational education or the "2+2" pathway and studying abroad (Concourse, 2017). Normally, one-third of high school graduates meet the entrance requirements of four-year undergraduate programs (Hong Kong Examination and Assessment Authority [HKEAA], 2021). The other popular pathway is the "2+2" articulation pathway: a two-year associate degree or higher diploma (called a "sub-degree" in Hong Kong) at a postsecondary institution, followed by a two-year bachelor's degree at a university. This "2+2" pathway is time-bound and has quotas. For instance, in 2021–2022, 5000 places at eight publicly-funded universities were allocated. These places are called senior-year places (iPASS, 2017) because two-year sub-degree graduates are admitted to the third year of four-year undergraduate programs. Locally, these students are called "senior-year admitted" (SYA) students, while internationally they are called "college transfer students". Normally, universities encourage these students to complete their studies in two years because the government only provides two years of financial support (Chan et al., 2021; Cheung et al., 2020; Lau et al., 2022).

In Chinese culture, parents expect their children to complete their education before entering the workforce (Lau et al., 2022). Due to the quota system, senior-year admission is a competitive alternative pathway. In this context, it is important to consider whether higher education is as accessible to college transfer students as it is to direct entrants. However, studies on this group of students in Hong Kong remain limited. Further research will allow universities to track and support students who follow a different trajectory. In particular, this study uses a learning analytics approach to answer the following questions:

1. What are the critical attributes that can predict college transfer students' success in language courses?
2. Are there differences in performance between college transfer students and their direct entrant counterparts in EAP courses?

## **Methodology**

### **Research design**

This research adopted a learning analytics approach with a focus on academic analytics (See the literature review for a more in-depth discussion). In practice, learner profile, instead of learning process, was analyzed to see how college transfer student performed differently from the direct entrant counterpart. To achieve this, research data was

retrieved from official school systems with the help of the relevant departments and used it to conduct data analysis. Demographic data of college transfer students who had studied at the university in the past two years was identified and retrieved with the help of the academic registry. Performance data was retrieved from the university learning management system. To allow for comparison, the learning data of other students taking the same courses was retrieved as well.

This project was approved by the respective ethics committee at the research site. Also, a formal data request was made with the university to obtain this data. According to the university's data governance framework, informed consent from the students was not required to be obtained from students. However, under the framework, the approved request did not give the authors permission to share the data or provide any identifiable information.

### **Dataset description**

The dataset retrieved from the academic registry included the courses taken by college transfer students over the previous two academic years. The dataset was organized so that each row represented one course taken by one college transfer student in one semester. In other words, there were multiple rows for each student. Each row included the following information: masked student ID, course code, course grade, current GPA, program of study, credits required to graduate, sub-degree completed (i.e. title of degree, discipline and awarding institution), graduating GPA for the sub-degree and English public exam score. The dataset also provided demographic information about the students in the study.

The second dataset included data from the learning management system, including masked IDs for all students, which helped identify the students in the first dataset. Because it contained the grades of all students over the past two academic years, this dataset helped compare the college transfer students' performance to that of other students.

### **Sample**

The main sample of this study comprised the 706 college transfer students identified using the academic registry. These students were required to take at least one language communication course at the university over a two-year period. Their ages were not available, but based on experience, these students were recent high school graduates (i.e. they were admitted to a sub-degree program after completing high school). One important point to note is that the sample only included transfer students who were required to take at least one language course; students who were exempt from language courses were not included. Among these students who did complete a language course, 153 of them had completed an associate degree and 553 had completed a higher diploma.

### **Data processing, screening and cleansing**

To answer the first research question, seven variables were derived from the two datasets. The first dataset was reorganized so that each row represented one student. We included each student's grade in the language communication course (i.e. as a binary variable, risk level), followed by (1) course load for current semester; (2) total credits

required for graduation; (3) type of sub-degree completed (associate degree or higher diploma), graduating GPA for sub-degree; (4) type of institution for sub-degree (e.g. affiliation with the research site, other universities or other postsecondary institutions); (5) current GPA for students when they were taking the language course; and (6) English public exam result, from the Hong Kong Diploma of Secondary Education (HKDSE). After generating this dataset, any unusual entries were checked with the academic registry. As this dataset was used for data mining, which is robust to outliers, no further screening or cleansing procedures were necessary.

To allow the graduating GPA of sub-degree a comparable variable, all GPA was converted to be a scale from 0 to 1. While GPA of some institutes can be a number out of 4 and some be out of 100, all graduating GPA are now a number from 0 to 1. Please be reminded that this does not affect other GPA variables (e.g. current semester GPA) as that was the data from the research site, i.e. having the same denominator (or four).

Since the first research question was to predict whether certain demographic variables predict students' performance in a language course, a new binary variable was derived based on students' final grades, with a B (3.0 out of 4.5) as the cut-off (i.e. F to C + /0–3.5 was "at-risk performance" and B to A + /3–4.5 was "satisfactory performance").

To answer the second research question, another dataset was generated with 10 variables, comprising all students' assessment component grades (five variables). The corresponding average grade of all students in the cohort for each assessment component was also retrieved (five variables). For example, for a student who took the course in Semester A of the first academic year, the corresponding average grade of all students who took the course in that semester was included for each assessment component. This calculation was performed after scrutinizing unusual entries and clarifying them with the data host. Since the dataset was subject to parametric statistical analysis, outliers (with a standard score of 3 or above) were detected and removed.

### **Variables**

Using these data processing and cleansing procedures, two datasets were generated. The first dataset included all college transfer students and their corresponding demographic features; it was used for a classification tree analysis. See Table 1 for a summary of all variables for classification tree analysis.

The second dataset included the course-specific grades of the college transfer students and the corresponding cohort averages. To provide a general picture of students' performance, the assessment component grades were grouped into five categories: Content Development, Organization, Language and Vocabulary, Presentation Skills and Referencing Skills. In other words, there were five overall scores for each college transfer student and five corresponding cohort averages. This allowed for further comparison of the college transfer students and other students. See Table 2 for a summary of all variables for grade comparison.

### **Data analysis**

To answer the first research question, a classification tree analysis was conducted. While many analysis strategies can help identify associations between student attributes and performance, the derived classification tree is easy to understand and interpret (Asif

**Table 1** Summary of variables for classification tree analysis

Variable name	Variable type	Actual Range	Mean score
Risk (Derived from the language course grade)	Binary	1-At-risk Performance 0-Satisfactory Performance	–
Effort (No. of credits taken when taking the language course)	Discrete Number	6–25.5	19.09
CreditforGr (No. of credits needed to complete for graduation)	Discrete number	61–96	68.71
CuGPA (Current GPA for the semester taking the language course)	Scale	0.63–3.71	2.80
DSE (English Public Exam Score)	Scale	0–5	2.15
CovGPA (Graduating GPA from the sub-degree program)	Scale	0.458–1	0.83
Type of institution (affiliated with the research site or not)	Binary	1-Yes 0-No	–
Type of sub-degree (Higher diploma or associate degree)	Category	1-Higher diploma 2-Associate degree	–

**Table 2** Overview of all Variables for Grade Comparison

Variable Name	Variable type	Actual range	Mean
Content development	Scale	0.00–3.80	2.62
Organization		0.00–4.00	2.53
Language		0.00–4.00	2.30
Presentation skills		0.00–4.00	2.58
Referencing		0.00–4.00	2.36
Content–cohort		2.13–2.91	2.66
Organization–cohort		2.18–2.90	2.58
Language–cohort		1.79–2.80	2.47
Presentation skills–cohort		1.99–3.00	2.71
Referencing–cohort		2.02–3.06	2.43

et al., 2017). Therefore, it can communicate the findings to different stakeholders and provide better support for students. Using this technique, all attributes were entered into the model to determine the critical components that predicted the at-risk/satisfactory performance of students. the accuracy rate of the predictions was used to evaluate this model.

To answer the second research question, a paired sample t-test was adopted to determine whether there are differences in performance between college transfer students and other students. It was used to compare the grades of college transfer students with the corresponding cohort averages. The authors argue that a paired sample t-test is appropriate because the key interest is in the difference between the college transfer students and the cohort. If an independent sample t-test had been used, the averages of the college transfer students and the cohort average would have been treated as two groups, which would not help us understand the specific difference in performance between them.

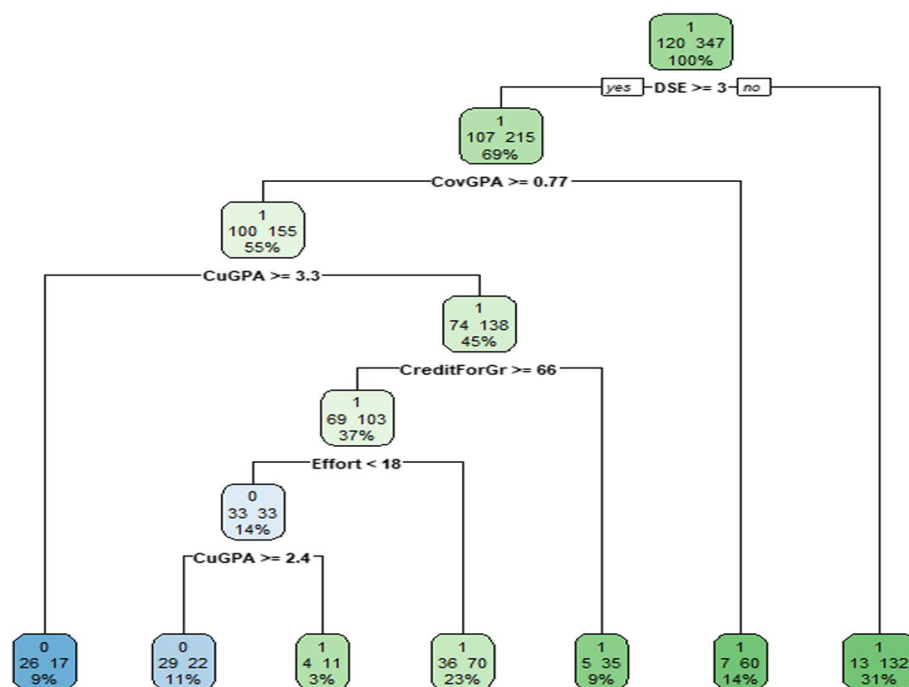
To conduct the paired sample t-test, the normality of all relevant test variables was assessed and confirmed with a visual inspection of the histogram. Since five pairs of variables are being compared simultaneously, the Bonferroni correction was used to avoid overestimating Type 1 errors. With an alpha of 0.05, the corrected alpha value was  $0.05/5=0.01$ . (See Andrade, 2019 for a more in-depth discussion of Bonferroni correction for multiple comparisons.)

**Results**

**RQ1: What are the critical attributes that can predict college transfer students’ success in language courses?**

To examine which factors predicted the performance of students, a classification tree analysis was adopted. Students were divided into two groups based on their final grades in the language course: at-risk students and satisfactory students. This derived binary variable was used as the dependent variable. The predictors were semester course load, total credits required for graduation, type of sub-degree completed (associate degree or higher diploma), graduating GPA for sub-degree, type of institution for sub-degree (affiliation with the research site, other universities or other postsecondary institutions) and English public exam result.

Figure 1 shows the classification tree derived from the analysis. Each node in the figure represents one criterion: If the criterion is met, one will look for the next criterion on the left; if the criterion is not met, one will look for the next criterion on the right. When one reaches the bottom of the figure, one will see a node with either “1” or “0”, with “1” representing the “at-risk” group and “0” representing the satisfactory group. For example, if a student achieved level 3 in public exam (first node, DSE, from the top), a



**Fig. 1** Classification tree to predict transfer students’ language course success



graduating GPA of 0.77 (the second layer of nodes) and a current GPA of 3.4 (the third layer of nodes; i.e. going to the next node on the left), one reaches the first node on the right at the bottom, which shows a “0”. This means that a student meeting all of these criteria is predicted to belong to the satisfactory group. Other factors include credits required for graduation and current course load (effort).

Based on this figure, some factors seem more decisive than others. For example, if students have not achieved a DSE level of 3 (e.g. level 1 or level 2), they are immediately predicted to belong to the at-risk group. Even if they do achieve DSE level 3, they are predicted to be at-risk immediately if their graduating GPA is 0.77. In other words, the factors related to students’ past achievements (i.e. public exam results and graduating GPA for sub-degree) can help identify at-risk students before they enrol in a language course. This may suggest avenues to better support students right after they are admitted and deserves further discussion.

To evaluate the classification tree model, the dataset was divided into a training dataset (70% of data points) and a testing dataset (30% of data points). The training dataset was used to train the aforementioned model. The testing dataset was used to “test” whether the algorithm could produce satisfactory results using “new” data. Its predictions were 70.94% accurate. While there is no common cut-off for accuracy, the rate of this algorithm is comparable to those in past studies, such as McDonald (2020) with 72.4% on college transfer students and Lee (2022) with 62%-65% on course placement. It is also important that, among percentage of the errors (29.04%), only 11.97% were at-risk students incorrectly predicted to be satisfactory students. The others were satisfactory students predicted to be at-risk. This means that only a small percentage of at-risk students would miss out on support measures. Moreover, there is no harm in satisfactory students receiving support. Therefore, this model seems to perform satisfactorily.

### **RQ2: Are there differences in performance between college transfer students and their direct entrant counterparts in EAP courses?**

To further examine the differences in performance between college transfer students and other students, a paired sample t-test was conducted. The test variables were students’ assessment performance in the areas of Content Development, Organization, Language and Vocabulary, Referencing Skills and Presentation Skills, and the test values were the corresponding cohort average of each area. Table 3 shows the means and

**Table 3** Summary statistics of grade comparison between college transfer students and cohort average

	Mean (standard deviation)		t (degree of freedom)	Effect size (Cohen’s d)
	College transfer students	Cohort mean		
Content Development	2.62	2.66	2.59(694)*	0.10
Organization	2.53	2.58	2.41(694)*	0.09
Language	2.30	2.47	9.29(694)*	0.35
Presentation Skills	2.58	2.71	6.59(690)*	0.25
Referencing	2.36	2.43	2.81(694)*	0.11

\*  $p < 0.01$

related statistics for the two groups. Transfer students performed worse in all areas than other students and all of the differences were statistically significant ( $p < 0.01$ ). The mean differences ranged from 0.20 (Language and Vocabulary) to 0.082 (Content Development). The differences for Language and Vocabulary ( $d = 0.35$ ) and Presentation Skills (0.25) had small effect sizes. These results provide insights into the aspects of language for which students need the most support.

## Discussion

### Interactions between trajectories and language course success

One objective of this study was to examine how different factors contribute to the success of transfer students' success in language courses. This study found that previous public English exam scores, community college GPA, current GPA at university, current course load and credits required for graduation all played a role in determining transfer students' success in their language courses. Interestingly, this echoes past studies predicting the general success of college transfer students. This includes studies finding that course load and community college GPA were important predictors of first-term GPA and degree completion (Nadasen & List, 2017), as well as another study finding that completion of an English course could predict first-term GPA among black students (Musoba & Krichevskiy, 2014). This suggests that the general success of college students is not linear. Course load, current GPA and community college GPA first determine students' success in English courses; then, these factors may interact with each other to contribute to students' general success. This means that while individual factors above contribute to the prediction model, these factors, collectively, may have an effect on the prediction models as well. For example, while course load and community college GPA each contribute to the success in English courses, these two factors collectively make a difference as well, i.e. students with higher community college GPA are more capable in handling heavier course load and thus they can handle the English courses effectively. Previous exam scores may also play a role in determining students' success in English courses. While past studies have examined other demographic factors, such as gender and ethnicity (Zhang, 2022), prior language exam results have not been included in many models.

Another interesting point to note is that the credits required for graduation and current course load are both important predictors of language course success. This reinforces the issue with course load described in many studies, such as Giani (2019) and Nadasen and List (2017). With evidence from this study, the authors argue that the more credits students need to graduate, the more courses they take each semester, which may make it hard for them to succeed in individual courses (e.g. a required English course). Course load can also affect students' engagement (Zilvinskis & Dumford, 2018), which may explain their performance to some degree. It may not be easy for students to succeed in individual courses (or in general) when the university does not accept the credits they completed at community college and requires them to take additional courses.

Generally, this means that the success of college transfer students in language courses is the result of a complex series of interactions between different factors throughout their educational trajectories, from public exam scores (in high school) and achievement in community college to the credits accepted by the receiving institution, current GPA

and course load. This seems to suggest that support for college transfer students should not only concern their status as such but the trajectories they follow. Potential support measures will be discussed in a later section.

### **Specific language needs of college transfer students**

In addition to institution-level factors, this study also aimed to examine the specific language needs of college transfer students by comparing their course performance with that of direct entrants. We found that transfer students, in general, did not perform as well as direct entrants in all of the following aspects: Content Development, Organization, Language and Vocabulary, Referencing Skills and Presentation Skills. However, the difference is most obvious in Language and Vocabulary. This means that transfer students are not as proficient in English as direct entrants. This is unsurprising considering the results of the classification tree analysis: a student's public exam score (which focuses solely on language proficiency, not academic literacy) was a key factor determining if they were "at risk" in their language courses.

There is an interesting contrast between the findings of this study and past studies. Most past studies have highlighted that transfer students lack discipline-specific academic literacy, such as knowledge of discipline-specific vocabulary (Foung, et al., 2022) and writing genres (Frodesen, 2015). They have subsequently developed support systems to help transfer students in these areas. In this study, the transfer students showed lower levels of English proficiency in general, not only academic literacy. One possible explanation is the lower admission requirements for transfer students in Hong Kong with regard to English public exam scores. While direct entrants must achieve level 3 in the public exam (HKDSE), the admission requirement for a sub-degree program is only level 2 (HKEAA, 2021). Then, it is assumed that transfer students become more proficient through courses provided by their community colleges. Therefore, when they are admitted to a university after completing their sub-degree, they are not required to take another public exam. In reality, however, they may not have improved, as most of their courses may have concerned academic literacy (e.g. citing references or reading academic sources; as suggested by Pullen, 2019) rather than increasing their general English proficiency, which thus remains lower than that of the direct entrants.

This study may explain the finding of other studies that the failure to complete remedial English courses can result in a lower overall GPA (such as Nadasen & List, 2017). While results in this study only indicate that these students perform worse in language courses, this can also present a barrier to success in other disciplines (Lin & Yin 1997). Since English is required in almost all courses, these students may not be able to give presentations and complete writing assignments effectively. This can explain why developmental English courses contribute to the overall success of transfer students.

### **Potential of LA to support for college transfer students**

This study shows that learning analytics (or specifically academic analytics) can be used to understand profile of students with different trajectories and potentially inform support measures that promote equity in higher education. While previous studies have provided direction on using data to examine students with different trajectories at the institutional level (Nadasen & List, 2017), this study focuses on how their performance

differs at the course level. In particular, extending past studies that considered the impact of completing English courses on the academic achievement of college transfer students, this LA study connects evidence from past studies on course load (Giani, 2019) and performance in community college (McDonald, 2020) with course-level success. This line of academic analytics research provides empirical evidence for policymakers using data generated within the established system (e.g. learning management system and academic registry). With empirical data collected from existing systems, it can be easier to convince policymakers to consider changes that would enhance the equity and accessibility of higher education.

Due to the success of this line of research, future learning analytics research could focus on confirming and validating the findings of other studies. For example, mathematics is critical to the success of college transfer students (Nadasen & List, 2017; Zhang, 2022). Empirical data can be used to re-examine how students' mathematics learning impacts their success in a developmental mathematics course (as the current study did with English).

Despite their identified weaknesses in English and mathematics, transfer students may perform better than direct entrants in some ways due to the competence they built in community college (see the related discussion by Cheung and Foung (2021) on transfer capital and transfer deficit). It may be possible to examine their learning trajectories in core courses and see how their learning pathways differ from those of direct entrants. For example, in a computer science context, Berland et al. (2013) conducted a learning pathway study on programming; their findings could perhaps be extended with learning analytics studies. More importantly, this would determine whether courses in certain disciplines could (or need to) become more accessible to direct entrants. These potential areas of learning analytics research can help enhance the equity and accessibility of higher education.

#### Limitations

While this study aims to build a strong argument on different trajectories that college transfer students take, readers are reminded of several limitations of this study. First, the current study mainly examines how demographic factors can play a role in student success in English courses. Factors such as students' attitudes towards language learning, learning process and curriculum design have not been accounted for. These factors contribute to students' success in English courses as well. Second, this study only examines a sample of college transfer students across many transfer students over the years. Programs at the community college may have changed to better prepare students for their four-year undergraduate studies. This may affect how we can understand the trajectory of these college transfer students. Despite these limitations, this study should have built a strong argument in understanding how college transfer students succeed in English courses.

#### Conclusion

This study examined the critical factors that contribute to college transfer students' success in language courses and their specific strengths and weaknesses. This study found that language proficiency, course load and past academic achievement are important factors. Moreover, transfer students have lower levels of general language

proficiency than their direct entrant counterparts. These are considered barriers to success in higher education. This study also examined the potential of learning analytics to help explore the learning needs of transfer students who are following a different trajectory in their higher education journey.

One important implication of the current study is the need for more robust support for students whose educational journeys follow different trajectories. Results of this study suggest that this is not easy because their success in language courses is largely determined by the courses they are taking in the current semester and over the course of their program. Therefore, this paper argues that the following measures may support college transfer students:

- Pre-semester support programs on general language proficiency could have been a better option as those programs would allow students to improve before starting a hectic semester instead of having an additional program in their regular timetables. These programs could focus on general language proficiency, not the academic literacy they developed in their sub-degree programs. This recommendation is similar to the induction program for transfer students introduced by Zahner and Harper (2022).
- While having students take more language courses may not be feasible, transfer students could be grouped into a specific section to provide them with specific support. While these sections would aim for the same learning outcomes as those taken by direct entrants, the teachers could provide more in-class instruction or specific feedback on grammar and vocabulary to increase the students' language proficiency. They could also design activities that would better meet the needs of transfer students.
- There should be better systems for community colleges and universities to communicate the learning outcomes of their courses to facilitate a more efficient credit transfer system. The root of many problems faced by transfer students, including those identified in this study, are the credits required for graduation. Previous studies have suggested inter-institutional collaboration for credit transfer (Cheung et al., 2019). It is important to note that based on the findings of this study, the authors are not arguing that credits for language courses should be transferred; rather, if students can transfer their other credits, it may relieve their burden during the semester and allow them to succeed in their language courses.
- Due to the importance of careful course load planning (which impacts success) evident in the current study, it is advisable to develop an intelligent dashboard to help transfer students choose appropriate courses. Some studies on academic advising have already implemented features that show students the likelihood of graduating on time or re-sitting (i.e. failing) a course (Charleer et al., 2018) for a given course plan. These features were originally implemented for advising students in general but are even more important for college transfer students, who need to plan their credits carefully to succeed in their courses and attain their degrees.

### Abbreviations

GPA	Grade point average
HKDSE	Hong Kong Diploma of Secondary Education
HKEAA	Hong Kong Examination and Assessment Authority
LA	Learning Analytics

### Acknowledgements

To be included.

### Author contributions

All authors involved in the drafting/revision of manuscript.

### Funding

The study was funded by the Teaching Development and Language Enhancement Grant for Language Enhancement Activities from The Hong Kong Polytechnic University.

### Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to the data governance framework at the research site.

### Declarations

#### Competing interests

The authors declare that they have no competing interests.

Received: 6 April 2023 Accepted: 31 October 2023

Published online: 17 November 2023

### References

- Andrade, C. (2019). Multiple testing and protection against a type 1 (false positive) error using the Bonferroni and Hochberg corrections. *Indian Journal of Psychological Medicine*, 41(1), 99–100.
- Archambault, K. L. (2015). The typology and needs of American transfer students. In P. A. Sasso & P. A. DeVitis (Eds.), *Today's college students: A reader* (pp. 215–224). Peter Lang.
- Asif, R., Merceron, A., Ali, S. A., & Haider, N. G. (2017). Analyzing undergraduate students' performance using educational data mining. *Computers & Education*, 113, 177–194.
- Berland, M., Martin, T., Benton, T., Smith, C. P., & Davis, D. (2013). Using learning analytics to understand the learning pathways of novice programmers. *Journal of the Learning Sciences*, 22(4), 564–599. <https://doi.org/10.1080/10508406.2013.836655>
- Buenaflo, S. H., Berhane, B., Fries-Britt, S., & Ogwo, A. (2022). "Everything is bigger and different": Black engineering transfer students adjusting to the intensity and academic culture of the 4-year campus. *The Urban Review*, 55, 1–31.
- Cabrera, A. F., Burkum, K. R., & La Nasa, S. M. (2005). Pathways to a four year degree: Determinants of transfer and degree completion. In A. Seidman (Ed.), *College student retention: A formula for student success* (pp. 155–209). ACE/Praeger Series on Higher Education.
- Chan, E., Cheung, K., & Ching, S. S. Y. (2021). Improving learning experience for community college transfer hospitality and tourism students. *Journal of Hospitality & Tourism Research*. <https://doi.org/10.1080/15313220.2021.1905136>
- Charleer, S., Moere, A. V., Klerkx, J., Verbert, K., & De Laet, T. (2018). Learning analytics dashboards to support adviser-student dialogue. *IEEE Transactions on Learning Technologies*, 11, 389–399.
- Cheung, K., Bin, L. I., Benz, P., Chow, K. M., Ng, H. M., Kwong, S., ... & Leung, A. (2019, May). Challenges in developing an online credit transfer information platform for potential senior year admitted students. Paper presented at *Learning and Teaching@EdUHK Festival 2019: "Excellence in Learning and Teaching in the Digital Era"*
- Cheung, K., & Foung, D. (2021). Transfer capital or transfer deficit: A dual perspective of English learning of ESL college transfer students in Hong Kong. *Sustainability*, 14, 214. <https://doi.org/10.3390/su14010214>
- Cheung, K., Ng, J., Tsang, K., Pang, K., Wan, J., & Moser, K. (2020). Factors affecting direct and transfer entrants' active coping and satisfaction with the university. *International Journal of Environmental Research and Public Health*, 17, 2803. <https://doi.org/10.3390/ijerph17082803>
- Concourse for self-financing post-secondary education. (2017). *Multiple pathways*. <https://www.cspe.edu.hk/en/Overview-MultipleEntryExit.html>. Accessed 1 April 2023.
- Foung, D., & Cheung, K. (2022). Transfer capital or transfer deficit: A Dual perspective of English learning of ESL college transfer students. *Sustainability*, 14, 214. <https://doi.org/10.3390/su14010214>
- Frodesen, J. (2015). Beyond first-year composition: Academic English instructional support for international transfer students. *CATESOL J*, 27, 33–54.
- Giani, M. S. (2019). The correlates of credit loss: How demographics, pre-transfer academics, and institutions relate to the loss of credits for vertical transfer students. *Research in Higher Education*, 60(8), 1113–1141.
- Hills, J. R. (1965). Transfer shock. *The Journal of Experimental Education*, 33, 201–215.
- Holland Zahner, D. G., & Harper, R. P. (2022). Validation of belonging among underrepresented undergraduates in STEM majors: Comparison of former transfer and non-transfer students. *Journal of College Student Retention Research, Theory & Practice*. <https://doi.org/10.1177/15210251221146119>

- Hong Kong Examination and Assessment Authority (HKEAA). (2021). *Entrance requirements for undergraduate programmes* [https://www.hkeaa.edu.hk/en/recognition/hkdse\\_recognition/local/](https://www.hkeaa.edu.hk/en/recognition/hkdse_recognition/local/). Accessed 1 April 2023.
- iPASS (Information Portal for Accredited Post-secondary Programmes). (2017). *Approved senior year student intakes of UGC-funded programmes*. <https://www.cspe.edu.hk/en/ipass/UGC2021.html>.
- Lau, Y. Y., Tang, Y. M., Yiu, N. S. N., Ho, C. S. W., Kwok, W. Y. Y., & Cheung, K. (2022). Perceptions and challenges of Engineering and Science transfer students from community college to university in an Asian educational context. *Frontier in Psychology*, 12, 797888. <https://doi.org/10.3389/fpsyg.2021.797888>
- Lee, C. (2022). Using classification tree models to determine course placement. *Educational Measurement: Issues and Practice*, 41(2), 82–89.
- Lin, J. C. G., & Yi, J. K. (1997). Asian international students' adjustment: Issues and program suggestions. *College Student Journal*, 31, 473–479.
- Long, P., & Siemens, G. (2011). Penetrating the fog: Analytics in learning and education. *EDUCAUSE Review*, 46(5), 30–40.
- McDonald, D. B. (2020). *Predicting transfer student degree completion at the University of South Florida-Tampa utilizing pre-matriculation data*. [Doctoral dissertation, University of South Florida]. USF Tampa Graduate Theses and Dissertations. <https://digitalcommons.usf.edu/etd/8468>.
- Monaghan, D. B., & Attewell, P. (2015). The community college route to the bachelor's degree. *Education Evaluation Policy Annual*, 37, 70–91.
- Moon, J., Lee, D., Choi, G. W., Seo, J., Do, J., & Lim, T. (2023). Learning analytics in seamless learning environments: A systematic review. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2023.2170422>.
- Musoba, G. D., & Krichevskiy, D. (2014). Early coursework and college experience predictors of persistence at a Hispanic-serving institution. *Journal of Hispanic Higher Education*, 13(1), 48–62. <https://doi.org/10.1177/1538192713513463>
- Nadasen, D., & List, A. (2017). Predicting four-year student success from two-year student data. In B. K. Daniel (Ed.), *Big data and learning analytics in higher education: Current theory and practice* (pp. 221–236). Springer.
- O'Connell, R. M., & Resuli, N. (2020). Academic challenges for Chinese transfer students in engineering. *Journal of International Students*, 10(2), 466–482.
- Pullen, T. (2019). Writing center use among transfer students. [Master's Thesis, Western Illinois University, Macomb] [http://www.wiu.edu/cas/english/graduate/thesis\\_projects.php](http://www.wiu.edu/cas/english/graduate/thesis_projects.php).
- Robison, M., Fawley, N., & Marshall, A. (2020). "That background knowledge": What junior and senior undergraduate transfer students need from their libraries. *The Journal of Academic Librarianship*, 46, 102092.
- Siemens, G. (2012). Learning analytics: Envisioning a research discipline and a domain of practice. In S. Buckingham, D. Gasevic, & R. Ferguson (Eds.), *Proceedings of the 2nd international conference on learning analytics and knowledge* (pp. 4–8). Association for Computing Machinery. <https://doi.org/10.1145/2330601>
- Wong, Y. L. (2019). Angels falling from grace? The rectification experiences of middle-class community-college students in Hong Kong. *Studies in Higher Education*, 44, 1303–1315.
- Wu, G. C., & Lau, K. (2021). Engaging senior-year admitted students' academic literacies across the discipline: A language practitioner's perspectives. *Innovations in Education and Teaching International*, 58(3), 294–304. <https://doi.org/10.1080/14703297.2020.1733044>
- Zhang, Y. L. (2022). Early academic momentum: Factors contributing to community college transfer students' STEM degree attainment. *Journal of College Student Retention: Research, Theory & Practice*, 23(4), 873–902.
- Zilvinskis, J., & Dumford, A. D. (2018). The relationship between transfer student status, student engagement, and high-impact practice participation. *Community College Review*, 46(4), 368–387.
- Zilvinskis, J., Willis, J., III., & Borden, V. M. H. (2017). An overview of learning analytics. *New Directions for Higher Education*, 179, 9–17. <https://doi.org/10.1002/he.20239>

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Submit your manuscript to a SpringerOpen<sup>®</sup> journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

---

Submit your next manuscript at ► [springeropen.com](https://www.springeropen.com)

---