

# Does Bilingual Instruction Impact Students' Academic Performance in Content-Based Learning? - Evidence from Business School Students Attending Bilingual and L1 Courses

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**Abstract:**

Despite the rapid adoption of bilingual programs (English-Chinese) in China's higher education institutions (HEIs), concerns have been raised on perceived language hindrance to students' academic comprehension and then performance. In response to this, this paper investigates the effects of bilingual instruction on content-based learning and provides empirical evidence after testing related influential factors in bilingual environment. Analyzing a sample of 498 undergraduate students enrolling in a fundamental business course in a sample university in China, we find insignificant statistical difference in students' academic performance between bilingual and L1 classes. We attribute this to the English language support provided by the university and show that learning competence can help students to minimize language barrier and furthermore solve the common learning problems confronted by both bilingual and L1 students. Overall, our paper aims to identify key determinants of students' academic performance in bilingual instruction and provide policy implication for developing desirable bilingual programs in HEIs.

**Keywords:** Bilingual program; Academic performance; Learning competence;  
English proficiency; Student workload

## 1. Introduction:

The language of English has been used extensively in China's universities such as 985 and 211<sup>1</sup> Universities since the opening-up reform in 1990s (Hu, 2004). The purpose of promoting the use of English in China's higher education is profound in many aspects, for example, to internationalize the institutes (Altbach and Knight, 2007; Huang, 2007; Kim Tatar and Choi, 2014) and increase competitiveness in global context (Coleman, 2006; Deem, Mok and Lucas, 2008; Costa and Coleman, 2013). Dobrota, Bulajic, Bornmann and Jeremic (2016) show that the adoption of English language can enhance university's global ranking and therefore attract international talents and students. English proficiency at tertiary level has been regarded as national and personal achievement (Adamson, 2001; Hu, 2002a; Jin and Cortazzi, 2003). In 2004, the Ministry of China's National Education published the No.4 Notice titled *Opinion on Further Strengthening the Undergraduate Teaching*<sup>2</sup>, advocating the needs of English medium education in university and college level. Following the No.4 Notice, the Bureau of Education in Shanghai City (SHC) specifically points out that colleges and universities in SHC should actively support bilingual (Chinese and English) education and set the target of 10% courses/subjects conducted bilingually by the end of 2004. Nowadays, students in many China's university can find non-language-learning courses taught bilingually. Additionally, a few courses are even conducted totally in English (Shi, 2016).

Reviewing previous literature, we observe that limited empirical research has been directed to the bilingual impact on understanding subject content despite one explicit reason for criticizing bilingual instruction is students' adequate comprehension. We linked the lack of research in the area to a number of reasons. Firstly, empirical research in this area needs the perspectives from cross-discipline groups and settings beyond language issues. To our best understanding, not many researchers have integrated cross-discipline studies to jointly examine the language impacts on non-language contents teaching and learning. Secondly, as suggested by Dafouz, Camacho and Urquia (2014), there is a lack of standardized content exams facilitating comparative analysis. It is not easy to analyze how language instruction will impact on different forms of examination. Thirdly, it is the confidentiality of attaining students' grades jeopardizing the data availability of the empirical research. This limitation constrains researchers to do empirical research in cross-country or cross-institution level. Finally, as pointed by Fortanet-Gomez (2013) and cited by Dafouz and Camacho (2016), a conceived political or ideological bias has been proposed since many researchers are in favor of negative results, especially regarding academic achievements would not benefit from those programs. Criticisms come from concerns on student's language proficiency and participation in the class (Wang, 2007; Sert, 2008; Byun, Chu, Kim, Park, Kim and Jung, 2011), instructors' qualification (Wang, 2007; Li, 2013; Crawford and Wang, 2015), rapid increase in teaching load (Van Der Walt, 2006; DeCourcy, 2008) and lack of university level supports (Yang and Gosling, 2014). In response to these problematic issues, our paper attempts to examine the effects of

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1 985 and 211 are the fundamental classifications of Chinese universities. Normally, the top 100 universities are the 985 and 211 university in China. Please refer to "*International Rankings and Chinese Higher Education Reform*" World Education News and Reviews. [http://en.wikipedia.org/wiki/Project\\_985](http://en.wikipedia.org/wiki/Project_985) Retrieved 2012-8-20 and [https://en.wikipedia.org/wiki/Project\\_211](https://en.wikipedia.org/wiki/Project_211)

<sup>2</sup> [http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe\\_734/200507/8296.html](http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/moe_734/200507/8296.html)

bilingual instruction on students' academic performance, at the same time, aims to provide empirical evidence on determinant factors in bilingual and native language environment.

The study utilizes data from a sample of 498 undergraduate students studying the subject of *Fundamental Accounting* in a China's 211 university. The subject offers parallel Bilingual and Chinese-Medium (L1) classes in the same semester. Following the university policy to maintain consistency, both classes use the same teaching material that is equivalently and consistently translated between English and Chinese<sup>3</sup> (i.e. syllabus, textbooks, homework, PowerPoint and exam papers). Kuteeva and Airey (2013) argue that educational policies should take the fundamental disciplinary differences into consideration when adopting English (L2) as medium instruction. Accounting is the fundamental subjects for the students to meet the requirement of Business Administration and Economic Degree in Business School. As China's accounting standards converged with International Financial Reporting Standard (IFRS) in 2007, China's 985 and 211 universities are strongly motivated to set up bilingual accounting courses to adapt students to the English-version IFRS. In response to the rapid development of bilingual programs, our study contributes to the literature in the following ways: (i) to statistically investigate impacts of bilingual instruction on students' academic achievement in the specific context that offers parallel L1 instruction for comparison; (ii) to examine the effectiveness of bilingual education and present valid empirical evidence on influencing factors, which provides feasible implications for students' learning achievement, teachers' pedagogical preparation and universities' management support in bilingual cases; (iii) to provide a fresh model of exploring effective learning condition for bilingual instruction and cogitating reflective thoughts for policy makers to plan directions for future development of bilingual programs in China's HEIs.

The rest of the paper proceeds as follows. Section 2 provides literature review and develops research questions. Section 3 discusses our sample selection, data collection, models, and the measurement of variables. Section 4 presents the empirical results, discussions, and sensitivity tests and finally the paper is concluded in Section 5.

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<sup>3</sup> L1 classes use the Chinese material while bilingual classes use the English material. Please refer to Research Methodology section for more explanation of teaching material.

## 2. Literature review and research question

A number of research on the L2 impacts have been conducted in the European context, especially in the countries of Spain, Sweden, Denmark, Austria, etc, in which the L2 language is English. In addition, some researches also examine the L2 language policy and impacts in Asian regions, such as Korean, Taiwan, Hong Kong, etc. However, the impact of L2 on students' academic performance is inconclusive (Dafouz and Camacho, 2016). On one hand, research claims that L2 students will have language difficulties in learning process and therefore may have lower academic performance as found in the Turkey (Sert, 2008) and Korean (Byun et al., 2011) context. Particularly, Sert (2008) reports that students may find it is not easy to comprehend subject content clearly which may prevent them from developing critical thinking ability. Byun et al., (2011) argue that the compulsory adoption of EMI in Korea seems lacking a much-needed support system and appropriate lecturers, therefore the overall implementation of EMI across academic disciplines have formed the opinion that EMI can hinder student's comprehension of the teaching content. A meta-analysis conducted by Lo and Lo (2014) reveals that unlike EMI programs in other educational contexts (e.g., Canada or Europe), the EMI education in Hong Kong may experience a failure of academic achievement due to students' insufficient language training and teachers' pedagogical skills deficiency. On the other hand, a number of researches find there are insignificant differences in the academic performance when comparing L1 and EMI students. A recent study by Dafouz and Camacho (2016) uses two groups of accounting students engaging in EMI and L1 (Spanish) classes. A total of 383 students' grades were collected and compared using mean difference tests. The result shows no statistical differences across groups. Similar results of insignificant differences also reported in Dafouz et al., (2014) studies from three first-year subjects (*Economic History, Financial Accounting and Finance*). Their work indicates that difficulties in EMI learning also experienced by the L1 students, which is mostly in the process of developing academic literacy. Besides, L2 students can have ease of access to authentic materials (Bergroth, 2006) and show their positive attitudes towards bilingual learning (Tong & Shi, 2012), their academic subjects' learning outcome is found not to be adversely affected.

Despite the growth in the use of English in China's bilingual programs, criticism arises in the process of dual-language teaching and learning from the perspectives of participants and policy makers (Hu, 2009; Hu and Lei, 2014). Though there is no organized longitudinal research conducted to investigate the academic accomplishment of learning non-language subjects in English, there are already some implications that the use of English in bilingual program may affect students' academic performance in unfavorable way. As suggested in Hu (2008, p51)'s critical review, "*the effectiveness of the costly bilingual education efforts fell far short of the claims.*" Shen (2004) admits that bilingual education may "injure subject learning" and requires strategies to amend the drawbacks. Some China's bilingual instructors have also complained about reducing or simplifying curricular content to enable students with inadequate language competence to understand the complex topics in English (Pi, 2004). Another report by Jin and Zhuang (2002) finds that the instructors have to teach major topics in Chinese again after half a semester of bilingual instruction because the students achieved poor performance in assessment. Wang (2007) analyzing the institutional background and implication of bilingual education at China's higher education system, suggests that bilingual education is not applicable to all subjects and course studies. Courses and subjects related to Chinese tradition and unique character should not be conducted in

bilingual manner. Li (2016)<sup>4</sup> examines the effectiveness of a bilingual program in social science majors at Chinese tertiary level and points out that the mastery of subject knowledge in the bilingual model is questioned. In a transition period to bilingual education, Shi (2016) find diverse performance in bilingual education between developed and underdeveloped areas in China. Regardless of the milestone accomplishment achieved by the tertiary institutions in China's top tier cities e.g. Beijing and Shanghai, more improvement and efforts are needed for those in the underdeveloped areas such as inland and western regions.

Considering the significant differences between Chinese and English language family (Janson, 2012), bilingual instruction is more popular than EMI in China's HEIs because it provides transitional language support to Chinese students in L2 environment. Following decades of reforms from government and educators, it is unique in Chinese higher education system. The manner of conducting bilingually is to lecture mainly in Chinese in the classroom but using all English teaching material, including textbooks, PowerPoint, exercises and examination. To preparing Chinese students well in the L2 environment, many China's Universities provide language support facilities and courses. If previous literature shows inconclusive impacts of language instruction (mainly L1 and EMI) on students' academic performance, we are motivated to find fresh empirical evidence in bilingual instruction in this particular setting. Therefore, our first research question (RQ1) is: Does bilingual instruction have impacts on students' academic performance compared to L1 instruction?

### ***English proficiency***

From the linguistic perspective, the concept of language proficiency and how it can be measured accurately has been controversial for decades (Cummins, 1980). In the domain of bilingual education, Cummins (1979) conceptualized a Threshold Hypothesis (TH) and states that: *the level of linguistic competence attained by bilingual children may act as an intervening variable in mediating the effects of bilingualism on their cognitive and academic development* (p. 232). According to Cummins (1979), students with low levels in both L1 and L2 (“*semilingualism*”) who fail to interact with their educational environments may experience certain disadvantages of academic achievement; for students with native-like level in either language (“*dominant bilingualism*”), there are no longer positive or negative cognitive effects on their bilingual competence; students with high levels in both languages (“*additive bilingualism*”) are likely to enjoy cognitive and academic advantages. To revisit the TH, a study conducted by Ardasheva, Tretter and Kinny (2012) using a sample of 18,528 language learners at different levels examines the possible impact of English proficiency levels on academic achievement of middle school students. The result shows that upon reaching adequate English level, English language learners (ELLs) can no longer suffer academic disadvantages. Another evidence found by Hamzah, Abdullah, and Ahmad (2015) reveals that there is a significant direct effect of English proficiency on academic achievement and suggests for more activities geared towards increasing students' language proficiency. Besides, ELLs are expected to experience more academic language use that

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<sup>4</sup> The university used in Li (2016) is in the northwestern China where the students' overall English proficiency level is considered to be below average compared to the southeastern coastal areas. Therefore, Li indicates that results may not be generalized to other China's university, showing research opportunity of investigating bilingual program effectiveness in areas with students having high English proficiency.

facilitates their content learning (Lin & Zhang, 2014). Specifically, Dong and Du (2013) conduct a survey on the relationship between Chinese students' academic performance and their CET scores. CET stands for China National College English Test and is designed to test non-English-Major students' general English ability in listening, speaking, reading comprehension and writing. Its purpose is to ensure that students meet the required English levels specified in the National College English Teaching Syllabuses (NCETS). CET has been operated in China for more than two decades and now has a huge test population of 18 million people annually (<http://www.cet.edu.cn/>).

It uncovers that significant correlation between CET scores and academic performance in bilingual education. Similarly, an empirical study (Han & Yu, 2007) exploring the requisite English skills for bilingual education among Chinese university students suggested that student can benefit from bilingual education when they achieve excellent level in CET4 or CET6. For college students in bilingual education, new reflections by Cummins (2016) indicate that older school-age students make faster progress than younger students (e.g. students in kindergartens or junior schools) in acquiring L2 academic proficiency because they can apply their better-developed cognitive/academic language proficiency to L2 learning. In turn, bilingual instruction also brings social benefits that students are likely to be more motivated when speaking to native speakers and developed more positive attitudes towards L2 (Lasagabaster & Sierra, 2009; Merisuo-Strom, 2006). Based on the previous research, English proficiency has been identified as a key dominant predictor of academic performance. Dedicated to developing students' communicative competence and critical thinking, the sample university provides them an intellectual English learning environment, which is more beneficial to students being "addictive" bilingualism. In this unique bilingual teaching environment, we are motivated to propose the second research question (RQ2): Does English proficiency play a fundamental role on students' academic performance in bilingual environment?

### *Learning competence*

In addition to English proficiency, we perceive learning competence is another key decisive determinant of students' academic achievement. Ning and Downing (2010) measure learning competence using Learning and Study Strategies Inventory (LASSI, Weinstein and Palmer, 1987 and 2002) and find a positive relationship between academic performance and learning competence. Students are motivated to change their learning strategy to deal with the difficulties in L2 environment. For example, Tatzl (2011) presents the results of questionnaire survey on students' attitudes, experience and challenges in Austrian context. The survey analysis shows that students recognize and tackle the challenges in EMI courses. Similarly, Airey and Linder (2006) and Airey (2009) find L2 students can adjust their learning strategy to deal with the language problem such as reading pre-lecture section and reducing note-taking to listen intensively. Learning fundamental terminology and vocabulary in a subject is equally important either in L1 or EMI courses. Therefore, for junior students, regardless of L1 or L2, they need to build a concept and theoretical framework that will lead to the application in advanced level. Hellekjaer (2010) using a sample of 391 respondents in L1 (Spanish) and L2 (English) instruction at three Norwegian HEIs, find that the lecture comprehension problems in L2 environment were similarly found in students' L1. These common problems are connected with the discipline's specific vocabulary and with the process of socializing students into domain-specific academic genres and registers with specific vocabularies (p, 248). For students to success in academic learning, their learning competence is also decisive

to tackle these common comprehension problems in their junior level (for example, see Basturkmen and Shackleford, 2015 in accounting discipline research and Klaassen, 2001 in engineering case). Therefore, we propose the third research question (RQ3): Can learning competence minimize the language's hindrance on students' academic performance in bilingual environment?

### 3. Research methodology

#### *Sample and setting*

The sample are undergraduate Students (second semester of first-year study) participating in the core course of *Fundamental Accounting* (BUS1004A) in a Chinese university's Business School on academic year of 2015. The Business School was set up in 1996 and currently, it has 61 full-time faculty and 2,269 students in the main campus. Its Program of Business Administration attained the *Well-Known* Program Awards from the Guangdong Provincial Education Department in 2006 and the Distinctive Program Awards from the China's Ministry of Education (MOE) in 2007. In 2012, its Bachelor of Business Administration was accredited by the European Foundation for Management Development (EFMD) Program Accreditation System (EPAS). In 2015 all of the undergraduate programs passed the EPAS assessment and won international accreditation. The university has established international cooperation and exchanges programs with 56 partner universities from 16 countries/regions, including HK, USA, Canada and many European countries, providing students with opportunity to go abroad for studies and exchanges. There are 45 compulsory courses provided by the Business School. Among them, 23 courses are conducted bilingually, and 9 courses are taught totally in English (L2) by international faculties. Due to the EPAS accreditation and increasing uses of English as coarse language, students in the exchange programs can receive credit recognitions and transfer between sample universities and the international partner institutions.

The proximity between English and other European languages (French, German, Dutch, Swedish etc.) is closer than the one between English and Chinese (Pérez-Cañado, 2012). In the European countries, bilingual (L1 and English) instruction are usually carried out in the secondary schools and EMI (L2) courses are provided in the higher education institutions (HEIs) level. Given the substantial differences in Chinese and English language families (Janson, 2012), bilingual instruction is considered more suitable than EMI for Chinese university students and it is conducted in the post-secondary level. The sample course offers parallel bilingual and L1 (Chinese) sessions. Bilingual sessions use English version material while L1 sessions adopt Chinese version material. The syllabus, textbooks, course material and exam paper used in both session are the same in contents and translated interchangeably. In bilingual class the instructor mainly uses L1 (China) in lecture and interaction. The sample Business School has commenced the bilingual classes to comply with the national policy of strengthening the undergraduate teaching advocated by the MOE since 2004. Currently, more than half of the compulsory courses in the Business School provide bilingual sessions. At the same time, the university set rigid qualification requirement in the bilingual teaching environment. To qualify as a bilingual instructor, an instructor<sup>5</sup> should have met the following conditions, i.e. (1) one of the degree thesis is written and presented in English (2) have successful experience in publishing paper (in English) in an international Journal as a first author or corresponding author (3) have attained international conference and presented the paper/outcome (4) PhD degree is a must.

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<sup>5</sup> The purpose of bilingual teaching qualification guidance is to demand candidate achieving required level of English competence in content teaching. The candidate is usually a Chinese faculty and Chinese language is his/her mother language. Therefore, there is no requirement in his/her Chinese language proficiency.

The sample university also has a well-established English Language Centre (ELC) initiated by the National Writing Project at University of California, Berkeley and commissioned by the Li Ka Shing Foundation in 2002. Over the past few years, the sample University has distinguished itself from other universities in China under the sponsorship of ELC which recruits half of its faculty from abroad. With the specialized mission of improving students' English language proficiency, learning autonomy and sustainability, intercultural competence and critical thinking, ELC has taken on the responsibilities of English teaching for the entire campus community (about 7000 students), including English-major students and graduate students, within the newly designed curriculum of the university's credit-bearing system. Regarding the accounting discipline, the transformation to bilingual teaching and learning is noticeable due to internationalization of Chinese financial accounting standards and its convergence with IFRS which is in the form of English. Many universities especially the 985 and 211 ones are motivated to provide bilingual accounting courses for the needs of employment (He, 2006). However, the question of whether bilingual courses can equip students with equal knowledge foundation compared with L1 courses remained unsolved.

Before selecting the sessions, students are required to take the examinations in the English Language Centre (ELC) to determine their English proficiency level. Also, the ELC provides academic language supports in reading, writing and listening to students enrolling in the bilingual courses. In the light of Chang, Kim and Lee (2015)'s studies, one solution to the hindering effects of L2 is to provide supportive leaning conditions and language assistance programs. The syllabus, textbooks<sup>6</sup>, PowerPoint and exam papers used in the bilingual and L1 programs are literally translated between two languages. We collect the whole sample of 520 students enrolling in these two sessions, 196 bilingual and 324 L1 students respectively. However, 12 of them missed CET6 test results, an important variable for controlling students' English proficiency level. 4 of them missed assessment score as a result of absences and 6 of them missed the values of control variables. After dropping 22 students with missing values, we have a final sample of 498. We further divide the students into groups based on their major of Business Administration, resulting in 118 accounting majors and 380 non-accounting major, such as finance and marketing. The course instructors are qualified and experienced lecturers/professors who have taught accounting subjects for many years. In addition to *Fundamental Accounting*, they also teach courses titled *Financial Statement Analysis*, *Intermediate Accounting*, *Auditing*, *International Accounting*, etc.

Accounting is the basic subjects for completing a Business-related degree however many business students consider accounting as the most difficult fundamental subjects required by the Business School (Dafouz and Camacho, 2016). Similar to many other academic subjects, accounting has its own vocabulary and language style that students need to understand so as to learn the subjects in depth and apply them into future profession (Basturkmen and Shackelford, 2015). Kieso, Weygandt and Warfield (2016) define accounting as identifying, measuring and communicating financial information about economic entities to interested users. The objective of accounting is to provide useful information for decision making. To fulfill the objective, accounting is considered as the language of business, aiming to disseminate the information to the hand of

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<sup>6</sup> There are two major publishers in China, namely China Machines Press (<http://cmpbook.emie.com.cn>) and Dongbei University of Finance and Economic Press (<http://www.dufep.cn/>), providing the translated (English-Chinese) version of the mainstream textbooks for the Business School in China.

decision makers who have information needs and their decision outcome can also influence the business operation. Thanks to the convergence between China's Financial Accounting Standards (CFAS) and International Financial Reporting Standards (IFRS) in 2007, the China's basic framework and definitions of key concepts and elements are inter-translated between the language of Chinese and English (<https://www.iasplus.com/en/jurisdictions/asia/china>). The convergence of the global accounting standards is beneficial to many global investors with investment in different nations because the comparability, consistency and readability of the financial statement across countries enhance under a common set of global accounting framework. Moreover, with the influence of internationalization in China's tertiary institutions, the top tier universities in China all develop bilingual accounting courses to prepare accounting students for the need of job markets. Students can either choose L1 or the parallel bilingual course depending on their career goal and interests.

### ***Empirical model***

The paper uses multiple regression analysis to test the impact of language of instruction on students' academic performance and control the effects of students' English proficiency level, learning competence and other important factors. As a statistical tool, multiple regression offers flexibility and adaptability to facilitate testing of a large number of independent variables and dependent variables. The regression model is presented as below:

$$Academic\ Performance_i = \beta_0 + \beta_1 Language\ Medium_i + \beta_1 Control\ Variables_i + \varepsilon_i$$

*Academic Performance* is a dependent variable deriving from the result of class participation, homework and paper-based examination results. Following the guideline set by the University's assessment policy<sup>7</sup>, the course has closely linked various assessment questions to course learning objectives. All teaching material (Chinese/English) and assessments are standardized to cover core learning objectives. Exam paper are cross examined by the L1 and bilingual instructors to maintain marking consistency. A score of 100<sup>8</sup> represents full mark and any score lower than 60 is considered as failed. *Language Medium* is a dummy variable of 1 if the course is bilingual and 0 is L1 conducted. We have other control / independent variables controlling the students' English level (Kim, Tatar and Choi, 2014), learning competence (Ning and Downing, 2010) and student workload (Van der Meer, Jansen and Torenbeek, 2010). Firstly, for students enrolling in the bilingual courses, English proficiency is a key determining factors on their academic performance because the course material and assignments are all in English. It is highly expected that higher English proficiency can help students to understand content subjects in English better and quicker. Student' English proficiency are proxied by the CET4 and CET6 score. Secondly, learning competence is another critical variable that is positively related to academic performance as suggested by Ning and Downing (2010), therefore, we measure learning competence by the proxy

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<sup>7</sup> Shantou University Document 2016 No.78: Management Regulation Of course Assessment (11ed). According to the university regulation, the Business School has introduced "Core Assessment Question Form" process to core/mandatory courses. The faculty members need to present core questions in the final exam, key component of the answer to the core question and evaluation standards. After assessment, faculty members are required to submit the "Continuous Improvement Form" to indicate the student achievement against the program leaning objectives and area of improvement.

<sup>8</sup> For many universities in China, students' academic score is recorded via using the centesimal or the hundred-mark system in which a score value ranges from one to one hundred marks.

of Grade Point Average (GPA). Thirdly, student workload is a controversial factor influencing academic performance (Szafran, 2001). In this study, we use the number of *credit hours* to be the proxy of workload.

## 4. Results and discussion

### *Descriptive statistics*

This section shows the descriptive statistics of students' academic performance, class type and control variables such as GPA score, English proficiency, study load. Through these descriptive statistics, students' performance and characteristics is reported and compared in difference class sections. Table 1 (a) shows the statistics of *Score* with a min of 46 and max of 92.5. *Score* is the comprehensive result of *Score1* and *Score2*, representing students' exams score and class performance respectively. Totally 187 students attending bilingual classes, accounting for 37.55% of the total enrollment. We then have 311 students attending L1 classes. On average, students have achieved 24 credit hours in the semester with a max of 25 hours and a min of 21 hours. *Credit hour* is used to measure students' workload as we assume that students with lower study load may have more time to spend on the course. The average scores of CET4 and CET6 in the sample are 519.97 and 470.93 correspondingly. The sample university's CET performance is ranked 28th in China and 5th in Guangdong Province in year 2015. Also, we have 25% of students with accounting major. Moreover, Table 1 (b) and (c) show the descriptive statistics for the L1 and bilingual classes separately. Bilingual students have lower credit hours and workload than L1 students. This may suggest that bilingual students can allocate more time for the subjective than their counterparts. Also, the results also show students in bilingual classes are associated with higher averages of GPA, CET4 and CET6.

Insert Table 1(a), 1(b) and 1(c) here

### *Main Result*

Table 2 present the OLS regression results of testing the relation between academic performance proxied by *Score*<sup>9</sup> and bilingual instruction proxied by *Bilingual*. Overall, the result shows the consistent and insignificant association between *Score* and *Bilingual* in different models. Linking the insignificant result to RQ1, it suggests that bilingual students do not necessarily perform poorer than L1 students. Similarly, a recent paper by Watzinger-Tharp, Swenson and Mayne (2016) suggest that dual language immersion (DLI) students performed at the same level as their non-DLI peers in tests given in English. Model (1) and (2) demonstrate the insignificant association with the control of English proficiency proxied by *CET4* and *CET6*<sup>10</sup>. CET or College English Test, is used to test the non-English-Major students' English proficiency in China. These tests have been operated in China for more than two decades and now has a considerable test population of 18 million people annually (<http://www.cet.edu.cn/>). In our sample, all the students are required by the university policy to take and pass CET4 as a condition for attaining undergraduate degree, however attending CET6 is not compulsory for the student. As a result, we have 235 students out of 498 in the sample taking the CET6 tests. Based on this, we further the tests by dividing the sample into with and without CET6 tests. More testing results can be found on Table 3. It is not easy to find reliable and convincing variables to measure students' English level.

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<sup>9</sup> *Score* is the comprehensive results including class attendance rate, home assignment and examination result. In sensitivity tests, we will individually regress the components of *Score* on the independent and control variables.

Nevertheless, CET4 and CET6 scores have been widely used by China's Ministry of Education and nationwide universities to test college students' English proficiency. After controlling English proficiency level, the association between *Score* and *Bilingual* is still statistically insignificant. In addition, we observe that in a bilingual environment in which textbooks, exercises and exams using English as a medium, the higher English proficiency level is significantly associated with higher academic performance (0.046 and 0.032,  $P < 0.01$ ). The positive association is consistent with Hamzah et al., (2015)'s findings, which suggests there is a significant direct effect of English language proficiency towards academic performance. Then, in model (3), we replace CET with *Credit Hours* and *GPA*, the proxy for study load and learning ability. Ning and Downing (2010) report the positive association between academic performance and learning competence with the effects of supplemental instruction. Consistently our results show that learning competence is positively and significantly associated with academic score (15.890,  $p < 0.01$ ) while the association between study load and score is not statistically significant. We then closely examine the data of study-load proxied by *Credit Hours* and find that the deviation in *Credit Hours* is minor. The study-load for the majority students in China's university is very standardized even though the system allows certain flexibility. Indeed, many universities in China have unwritten rules that undergraduate should finish the degree in four-year time. Therefore, college student' study-load in the same major is similar in each semester. Furthermore, we regress the models using all the control variables and find *GPA* is still significantly and positively associated with *Score*. In model (5) and (6) of Table 2, despite the insignificant coefficient between CET4/CET6 and *Score*, the coefficient between *GPA* and *Score* is significant. First of all, the answer to RQ3 is supportive because the significant result holds between *GPA* and *Score* in all models. Nevertheless, we would not simply suggest that learning competence is more important than English proficiency in bilingual course. Back to the sample, the university provides a sound language supporting program in place to help students gaining appropriate academic English skills<sup>11</sup>. As a result, the pre-course ELC training adapts the students well to the bilingual course. Linking Cummins (2016)'s *additive bilingualism* hypothesis to RQ2, we suggest that the insignificant correlation between *CET4/CET6* and *Score* does not plainly deny the positive role played by English proficiency in bilingual environment. Indeed, English proficiency is still an important factor contributing to their success in academic performance as shown in the following model (5) in Table 3 of sensitivity tests.

Insert Table 2 here

### ***Sensitivity tests***

To test RQ2, we divide our sample into two groups, i.e. *CET6 Dum* = 1 and 0. In the group of *CET6 Dum* = 0, the coefficient between *Bilingual* and *Score* is significantly negative (-3.534,  $p < 0.01$ ). Students in the group of *CET6 Dum* = 0 have either failed the CET6 or did not have the CET6 exam score and then are considered as having lower English proficiency level. Therefore, their comprehension of course contents in English material seem to be lower compared to the students in L1 classes. This consequently leads to lower academic results achieved by *Bilingual* students. On the other hand, students in the *CET6 Dum* = 1 are considered as possessing higher level of English proficiency and their understanding of English contents tend to be higher. This

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<sup>11</sup> More specifically, the sample university has a dedicated English Language Centre as shown in above discussion and the students' CET scores ranked 5th in the Guangdong region.

enable them to catch up with the counterparts in the L1 classes and therefore, we cannot see significant results between *Bilingual* and *Score* in Model (1) and (3) of Table 3. Overall, comparing the results in CET6 Dum = 1 and 0, we confirm and extend the regression results in Model (2) and (6) in Table 1. We furthermore test the different results within the sample of bilingual classes as reported in Model (5). The significant and positive result for *CET4* suggest that English proficiency matters in achieving higher academic score. This provides elevated extension to the results in Model (5) Table 1.

Insert Table 3 here

Undergraduate major is considered to have impacts on academic score as accounting students in the fundamental accounting courses may show more interests and commitment than students in other majors (Trusty and Ng, 2000; Tracey and Robbins, 2005). *Major* is a dummy variable of 1 if students majoring in accounting and 0 otherwise. Consistent with our assumption, Model (1) reports the significant and positive coefficient between *Score* and *Major* (4.252,  $p < 0.01$ ). In addition to *GPA*, *GAS* and *GBS*<sup>12</sup> are used as alternative proxies for learning competence (RQ3). *GAS* is scaled by total subjects' credit hours so as to minimize the impacts of work load while *GBS* is calculated by considering the impacts of English proficiency on students' result. Therefore, we drop *credit hours* in Model (3) and *CET4* in Model (4) to avoid multicollinearity. Consistent with the main tests on Table 2, we find insignificant correlation between *Score* and *Bilingual*. besides, the alternative learning competence measures are significantly and positively associated with *Score* both at  $p < 0.01$  level (*GAS*: 1.471 and *GBS*: 1.575 respectively).

Insert Table 4 here

We then run regression using different score components, i.e. *Score1* and *Score2*, representing students' examination score and class performance respectively and find insignificant correlation between *Bilingual* and different score components. On the contrary, Dafouz and Camacho (2016) report that average grade of active participation in EMI class is not as high as the one in non-EMI/L1 class, but exam grades in EMI class tend to be higher. Then they investigate the comparison further by classifying the grade into low, medium and high achiever. The content teacher in Dafouz and Camacho (2016) claims that low achievers participate less in classroom discussions, often fail to submit homework exercises and do not always complete practical exercises on the blackboard when requested. Responding to the contradictory results in class participation, we attribute the insignificant correlation between bilingual dummy and class participation in our sample to the transitional function provided by the bilingualism. In the fundamental level, students struggle with brand new concepts and terminology, building sound theoretical frameworks and academic literacy for the advanced level. Different from EMI, our bilingual lecturer uses L1 language simultaneously for content teaching and help students to deal with language obstacles in the learning process. According to Shi (2016), bilingual instruction is more accepted by the students than EMI in China's

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<sup>12</sup> The purpose of using *GAS* is to minimize workload's impact. For example, two students studying the same course with different workload receive the same academic result. The students with higher workload is considered to have higher *GAS* under its calculation formula. Also, the formula of *GBS* is to consider the impacts of English proficiency level on students' *GPA*.

HEIs. Consequently, many china's universities launch increasingly parallel bilingual programs for students with interests in L2 environment learning.

Insert Table 5 here

### ***Contributions, limitation and future research***

Based on Cummins Threshold Hypothesis, we empirically illustrate that students with high L2 competency ("additive" bilinguals) are likely to enjoy cognitive advantages and overcome language disadvantages to achieve academic benefits. To our best knowledge, the research on the impact of HEIs' bilingual programs on academic performance is limited and incomplete. As pointed out by Dafouz and Camacho (2016), previous research focusing on the language barrier and drawback of L2 teaching and learning, calls for more effective learning conditions and support facilities for all stakeholders involved. In response to that, we find that the language barrier to academic performance can be overcome in the setting of favorable and effective language support. Our results also provide empirical evidence to the limited research in the area of bilingual instruction and academic performance at tertiary level<sup>13</sup>. Considering the considerable differences in Chinese and English language families (Jason, 2012), bilingual instruction, instead of EMI are more appropriate for the China's HEIs students. Overall, our findings aim to enlighten policy makers to consider the support of university-level which will facilitate the effective teaching and learning in bilingual environment.

This research is among the few that show evidence to eliminate negative effects of bilingual instruction on students' academic performance. However, a number of limitations are discussed below with suggested future researches. First, it is the proxy for English proficiency. Even though CET4 and CET6 are nationwide acknowledged as standardized tests for Chinese university students' English language ability, it is suggested to explore specialized English language assessment for students' academic use. Cummins (1980) argues that cognitive/academic language proficiency (CALP) is empirically distinguished from basic interpersonal communicative skills (BICS). The distinction between CALP and BICS is nearly universally acknowledged by scholars, educators and policy makers and demonstrated in many research papers and books (Cummins, 2016). However, many researches cannot specifically test CALP and BICS and apply them to the analysis. The future research is recommended to separate CALP and BICS and test their effects individually. Second, it is the research methods. This paper uses multiple regression models to analyze language impacts on students' academic performance. However, supplemental research methods such as questionnaires, participants interview, and regular classroom observation can be adopted in future studies. These new tests will produce rich of elevated and analytical information to explain the effects of bilingual instruction. Last but not least, future research can also be directed to compare the different impacts of bilingual instruction and EMI. Although bilingual instruction is more popular than EMI in current China's HEIs, some top universities in Beijing and Shanghai offer increasing number of EMI courses because of the high English proficiency of lecturers and students

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<sup>13</sup> Different from this paper, a number of bilingual education and bilingualism research uses primary and high school samples to investigate the effect of bilingual education on students' achievement, see, for example, Farrell (2011) and Fernández-Costales et al., (2017).

and the supportive learning environment. This will provide unique and fresh opportunity of investigating whether learning in bilingual and EMI courses will result in different outcomes.

## 5. Conclusions

The paper compares the performance differences between bilingual and L1 classes to examine the language impacts in a non-native English setting. Our study shows that in addition to language medium, language proficiency and learning competence are influential determinants in students' performance. We develop the models to test various determinants' impacts and find that learning competence is more decisive than language proficiency in bilingual environment. Our work cannot be simply interpreted as denying the importance of English proficiency and ignoring language barrier on students' academic performance. Indeed, failure to recognizing the language hindrance and expecting students can mechanically adjust themselves to the bilingual environment is detrimental to students' comprehension on content-based learning. Our findings suggest that first, academic language proficiency or language skills enhanced by university language program can help students to overcome the language barrier that is not confronted by the L1 student; second, learning competence is a key to minimize the impeding effects of bilingual contents learning. Different from research on EMI, we find class participation is not weakened in the bilingual instruction process due to the transitional role and bridging function of bilingualism. The paper attempts to provide a better understanding of bilingual instruction and fresh empirical evidence for the current debate on language instruction and related supporting policy.

Table 1 (a): Descriptive statistics for the whole sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Score	498	77.584	10.451	46.000	92.500
Bilingual	498	0.376	0.485	0	1
GPA	498	3.253	0.457	1.480	3.915
Credit Hours	498	23.974	2.315	9.000	25.000
GAS	498	82.296	5.078	57.870	89.180
GBS	498	74.758	4.673	52.217	82.290
CET4	498	519.973	49.002	298.000	599.500
CET6	498	470.930	33.862	317.000	539.500
Accounting Major	498	0.237	0.426	0	1

Table 1 (b): Descriptive statistics for the sample of L1 class

Variable	Obs	Mean	Std. Dev.	Min	Max
Score	311	77.823	10.438	47.000	92.500
Bilingual	311	0	0	0	0
GPA	311	3.240	0.445	1.480	3.915
Credit Hours	311	24.093	2.125	9.000	25.000
CET4	311	517.754	47.954	389.000	599.500
CET6	311	469.510	35.12.8258	317.000	539.500
Accounting Major	311	0.232	0.422	0	1

Table 1 (c): Descriptive statistics for the sample of bilingual class

Variable	Obs	Mean	Std. Dev.	Min	Max
Score	187	77.187	10.488	46.000	92.500
Bilingual	187	1	0	1	1
GPA	187	3.274	0.476	1.480	3.915
Credit Hours	187	23.775	2.593	9.000	25.000
CET4	187	523.663	50.611	298.000	599.500
CET6	187	473.300	37.610	345.000	539.500
Accounting Major	187	0.246	0.432	0	1

Table 2: Main effects

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
VARIABLES	Score	Score	Score	Score	Score	Score
Bilingual	-0.909 (-0.960)	-0.554 (-0.374)	-1.191 (-1.695)	-1.14 (-1.653)	-1.156 (-1.635)	0.960 (0.811)
Credit Hours			-0.016 (-0.055)		-0.039 (-0.132)	0.435 (1.425)
GPA			15.890*** (16.563)	16.226*** -17.832	16.352*** (14.964)	15.160*** (9.902)
CET4	0.046*** (4.719)			-0.01 (-1.246)	-0.010 (-1.237)	
CET6		0.032** (2.300)				-0.003 (-0.253)
Constant	53.916*** (10.520)	60.844*** (9.290)	26.737*** (4.513)	30.304*** -7.665	30.923*** (4.393)	17.143*** (1.997)
Observations	498	235 <sup>#</sup>	498	498	498	235 <sup>#</sup>
R-squared	0.048	0.022	0.480	0.481	0.482	0.399
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05 We have 235 students in the sample taking the CET6 tests.						

Table 3: English proficiency grouping

	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
VARIABLES	Score	Score	Score	Score	Score
	CET6 Dum =1	CET6 Dum =0	CET6 Dum =1	CET6 Dum =0	Bilingual = 1
Bilingual	0.998 (0.864)	-3.534*** (-4.424)	0.960 (0.839)	-3.540*** (-4.457)	Automatically Omitted
Credit Hours	0.410 (1.021)	-0.208 (-0.521)	0.435 (1.074)	-0.205 (-0.521)	0.320 (0.826)
GPA	15.484*** (9.654)	16.828*** (11.392)	15.160*** (9.303)	16.738*** (12.796)	14.653*** (7.023)
CET4	-0.010 (-0.695)	-0.003 (-0.221)			0.011** (0.815)
CET6			-0.003 (-0.232)	Automatically Omitted	
Constant	20.456 (1.736)	31.843*** (3.867)	17.143 -1.586	31.081*** (4.456)	16.067** (1.988)
Observations	235	263	235	263	187
R-squared	0.400	0.400	0.399	0.607	0.545
CET6 Dum: a dummy variable of 1 if student passed CET6 tests and 0 otherwise. Bilingual: a dummy variable of 1 if the course is bilingual and 0 otherwise. Robust t-statistics in parentheses, *** p<0.01, ** p<0.05					

Table 4: Different control variables

	Model (1)	Model (2)	Model (3)	Model (4)
<b>VARIABLES</b>	Score	Score	Score	Score
Bilingual	-0.338 (-0.392)	-1.156 (-1.635)	-0.958 (-1.315)	-0.893 (-1.215)
Credit Hours	1.652*** (5.808)	-0.039 (-0.132)		-0.181 (-0.567)
CET4	0.028*** (3.187)	-0.010 (-1.237)	-0.005 (-0.638)	
Major	4.252*** (4.432)			
GPA		16.352*** (14.964)		
GAS			1.471*** (13.237)	
GBS				1.575*** (12.714)
Constant	22.565*** (2.784)	30.923*** (4.393)	-34.871*** (-4.729)	-31.148*** (-4.243)
Observations	498	498	498	498
R-squared	0.225	0.482	0.455	0.443
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05				

Table 5: Different dependent variables

	Model(1)	Model(2)	Model(3)	Model(4)	Model(5)	Model(6)	Model(7)	Model(8)
VARIABLES	Socre1	Socre1	Socre1	Socre1	Socre2	Socre2	Socre2	Socre2
	Full sample		CET6 Dum = 1		Full Sample		CET6 Dum = 1	
Bilingual	0.826 (0.945)	0.824 (0.941)	1.551 (0.913)	1.705 (0.996)	-1.830 (-1.617)	-1.827 (-1.609)	-1.685 (-0.895)	-1.676 (-0.881)
Credit Hours	0.267 (1.141)	0.262 (1.124)	0.118 (0.307)	0.017 (0.044)	0.237 (0.507)	0.245 (0.524)	0.838 (1.413)	0.832 (1.378)
GPA	5.145*** (4.135)	5.252*** (4.080)	4.524** (2.409)	5.550*** (2.948)	16.652*** (8.494)	16.471*** (8.000)	17.132*** (6.718)	17.396*** (6.797)
CET4	0.001 (0.094)	0.001 (0.103)	0.015 (1.049)		0.030** (2.049)	0.030** (2.044)	0.019 (0.881)	
Major		-0.271 (-0.288)				0.459 (0.327)		
CET6				-0.008 (-0.602)				0.014 (0.736)
Constant	64.466*** (11.613)	64.256*** (11.364)	62.740*** (5.657)	73.221*** (6.978)	-3.896 (-0.355)	-3.540 (-0.321)	-16.567 (-0.965)	-13.850 (-0.841)
Observations	498	498	235	235	498	498	235	235
R-squared	0.101	0.101	0.059	0.056	0.328	0.328	0.313	0.312
Robust t-statistics in parentheses, *** p<0.01, ** p<0.05								

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