Quantifying the impact of language on the performance of international accounting students: A cognitive load theory perspective

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A R T I C L E   I N F O

A B S T R A C T

This study offers timely empirical evidence of the magnitude of the language effect on the performance of different language user groups, namely English as a Foreign Language (EFL), English as a Second Language (ESL), and English as a Native Language (ENL) in an accounting program instructed in English, an area that has been under researched. Informed by Cognitive Load Theory (CLT), this study develops an innovative research methodology (crossover repeated measures design), drawing on a large data analysis (n = 2912) of students' academic results in six accounting specialisation subjects between 2007 and 2014 in an Australian university's undergraduate accounting program. Results show that while all language user groups perform worse in more conceptually (MC) oriented subjects compared to less conceptually (LC) oriented subjects, the relative performance between MC and LC is strongly related to English language user groups. For the first time the magnitude of the impact is derived. The study has implications for the instructional design of accounting programs in English-speaking universities and their offshore programs in non-English speaking countries.

1. Introduction

Issues related to the teaching and learning of international students undertaking courses instructed in the English language are becoming increasingly relevant as the number of such students surges. The Organisation for Economic Co-operation and Development (OECD, 2017) reports more than 50% of 4.6 million international students were studying in courses by English speaking countries in 2015. International students from China accounted for 20% of international students globally in 2015, leading the second largest source country, India, by 13% (OECD, 2017). Australia is a major player in the international student market ranking third in English speaking countries (after the USA and the UK) in terms of onshore numbers. The proportion of Chinese international students in Australia is even greater. DET (2017) reported that Chinese international students made up 30% of the 621,192 international student enrolments in Australia as of November 2017, followed by India (11%), Nepal (5%), Malaysia (4%), and Brazil (4%). The vast majority of the international students undertake study in Commerce, with Accounting being the most studied discipline within Commerce (Benzie, 2010; Department of

Education and Training; DET, 2017). The strong growth in international students positively contributes to the cultural diversity of the host universities, and the financial sustainability of the universities which are facing the challenges of reduced government funding (Benzie, 2010; Oliver, Vanderford, & Grote, 2012; van der Walt, 2013). However, the large surge of international students in English-speaking universities also presents great challenges. There have been consistent reports of language-related learning difficulties experienced by some cohorts of international students in discipline studies. The most common problems are related to writing, oral comprehension and communication, and reading (see Hellstén & Prescott, 2004; Li, Chen, & Duanmu, 2010; Sawir, Marginson, Forbes-Mewett, Nyland, & Ramia, 2012). However, the issue is more nuanced than simply suggesting all cohorts of international students have such problems. The breakdown of international students mentioned above highlights there are two distinct cohorts of non-native English speaking international students studying English language disciplinary programs, both of which are very large. There are English as a foreign language (EFL) students, as represented by the majority of students from countries such as China, Nepal and Brazil, and English as a second language (ESL) students, as represented by the majority of students from countries such as India and Malaysia. Due to the different contexts of ESL and EFL, any study into language-related teaching and learning issues of international students need to distinguish between these two cohorts (Karbalaei, 2010).

The distinction between EFL and ESL students in this study (also see Section 4.1) is informed by Kachru's (1985) model. Despite Kachru's model being at risk of over simplification, the model is still very useful to distinguish English language users from countries where English is historically the monolingual official language (e.g. Australia, the UK), those from countries where English historically was not the native language, but has become one of the multilingual official languages (e.g. India, Malaysia), and those from countries where English has never been an official language (e.g. China, Nepal, Brazil). As explained in Kachru (1985, pp. 242–243), there are three circles of English language user groups. They are inner circle, outer circle, and expanding circle. The inner circle refers to the traditional bases of English, where it is the primary language (i.e. English as native language, ENL), for example, the USA, the UK, Canada, Australia, and New Zealand. The outer (or extended) circle represents the use of English in non-native contexts, where it has been institutionalized as an official language or otherwise for historical reasons (i.e. English as second language, ESL), for example, India and Malaysia. The expanding circle represents those countries where English has no history of colonisation or special administrative status, and is used as a foreign language for specific purposes (i.e. English as foreign language, EFL), for example, China. The expanding circle has seen a steady increase in the use of English primarily as an international language especially in the business, scientific, legal, political and academic communities. The need for professionals in EFL countries to communicate in English increases with rank and experience (Evans, 2010).

Combining all of the above justifies this article's approach of studying a language-related teaching and learning issue for international students from China (the largest EFL group) and Malaysia (the second largest ESL group) undertaking an undergraduate degree in Accounting in an Australian university.

Prior studies (e.g. Holthoff, Hoos, & Weissenberger, 2015; Li et al., 2010) reveal that cognitive academic language proficiency (CALP, Cummins, 2000) plays a crucial role for international students in completing their studies in English-based institutions. CALP refers "to the degree to which an individual has access to and expertise in understanding and using the specific kind of language that is employed in educational contexts and is required to complete academic tasks" (Cummins, 2000, p.55). CALP consists of the knowledge of academic language and the knowledge of specialized subject matter (Cummins, 2000; Krashen & Brown, 2007). However, no prior research has specifically examined the effect of language on the *relative* (for a detailed explanation of this concept see section 4.2) academic performance of different language user groups (i.e. ENL, ESL and EFL) in the context of the accounting discipline. The lack of research into how language has impacted the performance of ENL, ESL and EFL accounting students presents a problem of conceptualising CALP in the context of the accounting discipline.

The lack of research into the effect of language on the academic performance of students from different language groups in the accounting discipline can be explained by the fact that such interdisciplinary study needs a research team with members that have the required expertise in language, education, and accounting (Dafouz, Camacho, & Urquia, 2014; Dafouz & Camacho-Miñano, 2016). For example, the R&D project INTERLICA[1] based in Spain is one of the few known interdisciplinary teams in this field of study with the required combination of expertise. Adding to the difficulty is data access, an issue recognised in a recent study by Dafouz and Camacho-Miñano (2016). The research team of this current study is fortunate to access a unique set of data, and to comprise members who are well experienced in leading and teaching Australian accounting programs, and their offshore (overseas) operations in China and Malaysia, for more than three decades. They are involved in dealing with the learning issues of accounting students on a daily basis, and are challenged by the language-related learning difficulties of some international students (mainly Chinese). Those challenges motivated them to undertake the current study to examine the magnitude of the language effect on the academic performance of students in English-based accounting programs. Specifically, the study draws on cognitive load theory (CLT, Sweller, Ayres, & Kalyuga, 2011; Sweller, 2010; 2016; 2017) to explain the cause of language-related learning difficulties of EFL international students (learners) in the accounting discipline. This is then followed by empirically investigating the effect of language on the relative academic performance of EFL (represented by Chinese international students), ESL (represented by Malaysian international students), and ENL

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[1] See https://www.ucm.es/interlica-en for further details.

(represented by Australian local students) students in an Australian university's undergraduate accounting program (AU's accounting program).

This study develops an innovative crossover repeated measures design (Jones & Kenward, 2014; also see Section 4.2) to examine the magnitude of the impact of language on the relative performance of EFL, ESL and ENL students enrolled in AU's accounting program between 2007 and 2014. The sample used in this study is larger than prior studies in terms of the student numbers (with data sourced from the academic results of 2912 students) and the range of accounting specialisation subjects. Recent interdisciplinary studies were often limited by basing their findings on one accounting subject at the first year undergraduate level (see, for example, Basturkmen & Shackleford, 2015; Dafouz & Camacho-Miñano, 2016; Dafouz et al., 2014). This leads to limited understanding of the role of language in academic performance in the accounting discipline as a specialisation degree program. In contrast, this study analyses the academic results based on six accounting subjects that range between soft and hard dimensions within the applied accounting discipline (see Biglan, 1973; Neumann, Parry, & Becher, 2002). Findings of the study reveal a significant and quantifiable difference in the relative performance of EFL, ESL, and ENL students in more conceptually oriented accounting subjects (see Section 2 for further information) compared to less conceptually oriented accounting subjects.

This study contributes to the literature of English for specific purposes in the accounting discipline in the following ways.

Theoretically, this study extends the application of cognitive load theory to explain language-related learning difficulties of EFL international students in the accounting discipline. The study not only recognises language-related learning problems of EFL international students in an English-medium accounting program, but also offers a systematic explanation for the cause of those problems.

Empirically, this study distinguishes itself from prior studies in that it adopts a crossover repeated measures design, which effectively controls for individual learners' characteristics (e.g. academic capabilities, gender, socioeconomic status, or parents' level of academic achievement) to measure the performance of different English language users in two groups of accounting subjects with different language needs. Therefore, the findings of this study complement current qualitative ESP literature of a more quantitative bent.

Finally, the findings of this study have instructional implications for accounting academics and language specialists in English-medium accounting programs.

The remainder of this paper is structured as follows. Section 2 outlines the setting of the current research. Section 3 presents the analytic framework informed by CLT and hypothesis development. Section 4 describes the research design and reports results, and Section 5 concludes the study.

2. Language-related learning difficulties of EFL international students

The current study is focused on an undergraduate accounting degree program offered by a large public university in Australia (AU). The program is also offered through AU's offshore partner institutions in China and Malaysia. AU's accounting program is accredited by national and international accounting professional bodies including the Certified Practising Accountants Australia; the Institute of Chartered Accountants of Australia and New Zealand; Institute of Chartered Accountants Edinburgh and Wales; and the Association of Chartered Certified Accountants. The student cohort at the Australian campus consists of domestic students, who are mainly ENL students, and international EFL and ESL students. AU's offshore partner institutions in China and Malaysia are prestigious universities in their home countries. This creates an atypical situation at AU in comparison to most other Australian universities in that the academic admission standard for its international students is higher than for domestic students. Domestic school leavers admitted in Australia at AU are mainly in the top fifth or sixth decile of academic ability in their State whereas the students at the Chinese partner institution are in the top quartile of students from their Chinese Province. Equivalent data is not available for international students admitted in Malaysia. However, their performance in a common first year degree program suggests that they sit between Australian domestic and Chinese students on academic ability when admitted. The international students from these two countries account for the majority (90%) of the international students enrolled at AU. The language diversity of students in AU's accounting program offers a unique opportunity to investigate the magnitude of how language has influenced the academic performance of EFL, ESL and ENL students.

The motivation for this research came from five different sources based on AU's regular teaching and learning review activities in their (onshore and offshore) undergraduate accounting programs. They include one-on-one meetings with students who made unsatisfactory academic progress in accounting (hereafter progress meetings), a focus group meeting with 20 Chinese international students who graduated from the program in 2016, student evaluation of units (SEU) reports over three years (2015–2017), 67 Chinese international students' 2017 exam scripts in a final year capstone accounting subject, and meetings with accounting academics teaching AU's program (2016–2017) in China and Malaysia.

One language-related learning issue commonly reported by students and accounting academics is the difficulty of learning accounting subjects that involve more reading and writing than those that involve more formula and calculation. Students and academic staff described the former as "more conceptually oriented (MC) subjects", and the latter as "less conceptually oriented (LC) subjects" (see Section 4.1 for further explanation). MC subjects (e.g. accounting theory, auditing) involve intensive reading, writing, case studies, presenting arguments, and professional judgements. In comparison, LC subjects (e.g. corporate finance, corporate accounting) tend to involve more formulas and calculations, and the extent of reading, writing and presenting argument is much less than for MC subjects.

The observed description of two groups of accounting subjects (MC versus LC) reflects the differences in the inherent subject matter characteristics, namely, hard versus soft, and pure versus applied dimensions in university teaching (Biglan, 1973; Neumann, 2001; Neumann, et al., 2002; Dafouz et al., 2014). Although the characterisations of subject matter are more generally applied to different disciplines (e.g. engineering versus liberal arts), researchers (Biglan, 1973; Neumann et al., 2002) suggest that such characterisations can also be applied to different subjects within a discipline. The study by Dafouz et al. (2014) has explicitly applied the concepts of hard and soft subject characterisations within a business discipline based in Spain. While accounting has generally been identified as an applied discipline (Biglan, 1973) it has subjects that straddle across hard and soft dimensions. According to Neumann et al. (2002, pp. 408–413), the curriculum objectives of the hard applied dimension are based on factual understanding and focused on the progressive mastery of techniques in a linear sequence. In comparison, the curriculum objectives of the soft applied dimension are centred on gathering knowledge in a nonlinear way, and are influenced by highly practical knowledge or personal beliefs. The hard applied dimension puts a greater emphasis on practical competencies and on the ability to apply theoretical ideas to professional contexts (although students are implicitly required to have a good memory and a competence in problem-solving). Whereas in the soft applied dimension, students are required to apply a more open-ended problem solving ability by relying more on oral and written communication. The description of MC and LC subjects by staff and students at AU is consistent with the soft (MC) and hard (LC) dimensions in the context of the applied accounting discipline.

A consistent theme coming from EFL students in progress meetings, the focus group and comments on SEU was that they expend considerable effort on translation (mentally or using notes) to help them to understand accounting content in English language and that such effort is considerably greater in MC subjects compared to LC subjects. The comments by students were confirmed by the analysis of exam scripts where researchers noted that 43 (64%) exam scripts had annotated Chinese translation of English accounting terminologies on the exam question booklets even though students answered in English on the answer booklets. Further confirmation came from staff teaching in China who indicated that there was a considerable student backlash when staff stopped a long-term practice of supplying translations of the more difficult accounting concepts in MC subjects.

The feedback and supporting evidence of EFL international students' language-related learning difficulties in AU's accounting program echoes the learning issues of EFL learners reported in prior studies (Al Haddad, Mohamed, & Al Habshi, 2004; Liang & Mohan, 2003; Holthoff et al., 2015; Yang, 2012). For example, the study by Evans and Morrison (2011, p.203) documented language related difficulties perceived by EFL students from an English-medium university based in Hong Kong. They include using appropriate academic style, expressing ideas in correct English, understanding technical words, and working out the meaning of difficult words, grammar and pronunciation, and writing in English. The observed learning problems highlight the challenges faced by non-ENL learners in the process of academic acculturation in English-speaking universities. Cheng and Fox (2008, p.309) described academic acculturation as "the dynamic adaptation processes of linguistically and culturally diverse students engaging with the academic study cultures" of English-medium universities. Because academic language is context-reduced (when compared to the context-embedded basic interpersonal communicative language skills as explained further in Section 3) it is cognitively demanding for all language group learners. However, it is more challenging for EFL and ESL international students compared to ENL students in the process of academic acculturation (Liang & Mohan, 2003). This is because non-ENL international students as newcomers to English-speaking countries struggle to develop networks that will allow them to participate in the process of academic acculturation (Benzie, 2010).

The reported use of translation observed in the AU program is consistent with the findings reported in the study by Tan and Lan (2011) who showed the effectiveness of using translation (Bahasa Malaysia) to teach Malay students in English-medium mathematics and science classes in Malaysia. It lends support to the argument that the use of EFL students' first language facilitates the understanding of discipline specific content instructed in English (Kim, Kim, & Kweon, 2018; van de Walt, 2013) although it inevitably increases the reading time.

Despite the growing attention to the CALP and the academic performance of EFL international students in English-medium academic programs, few studies (especially from business disciplines) offer a systematic explanation for the cause of language-related learning difficulty of EFL international students. Prior studies in the field of applied linguistics are dominated by qualitative studies (with small samples), with very few having drawn on a large data collection. Exactly why is language regarded as more of an issue in MC subjects than LC subjects by EFL learners? To what extent has language affected EFL learners' academic performance in different components of accounting programs? These research questions will be addressed in this study.

The following section will present an analytic framework based on cognitive load theory (CLT) to systematically explain the cause of language-related learning problems of EFL learners in discipline studies instructed in English language.

3. Cognitive load theory and EFL students' performance

Cognitive load theory (CLT) is "concerned with the learning of complex cognitive tasks, in which learners are often overwhelmed by the number of interactive information elements that need to be processed simultaneously before meaningful learning can commence" (Paas, van Gog, & Sweller, 2010, p.116). CLT considers the knowledge of human cognitive architecture (see Sweller et al., 2011) to be critical to instructional design. CLT explains that information will be first processed by short-term working memory (WM) before it can be stored in long-term memory through the building of schema, which

determines the level of an individual's performance in a given area. However, the WM has limited capacity (i.e. working memory resources); if the cognitive load exceeds the working memory capacity, then learning becomes inefficient, and hence affects the learners' performance.

The following diagram (Figure 1) illustrates the relationship of the key components of CLT drawing on the work from Sweller (2010) and Sweller et al. (2011).

As illustrated in Figure 1, the overall cognitive load is the sum of intrinsic cognitive load (ICL) and extraneous cognitive load (ECL) which are determined entirely by total element interactivity. An element is "anything that needs to be or has been learned, such as a concept or a procedure" (Sweller, 2010, p. 124). Element interactivity levels are determined by estimating the number of interacting elements which simultaneously take into account the nature of the information (content and learning materials) and the knowledge of learners (learner characteristics). "Low element interactivity materials allow individual elements to be learned with minimal reference to other elements and so impose a low working memory load" (Sweller, 2010, p. 124; also see; Sweller, et al., 2011, p.59). In contrast, "high element interactivity information consists of elements that are closely related to each other and so cannot be learned in isolation. The elements interact in a manner that renders learning individual elements in isolation meaningless. All relevant elements must be processed simultaneously in order to be learned in a meaningful fashion" (Sweller, et al., 2011, p.60). One important learner characteristic is the extent to which learners have already built relevant higher level schema, or even automated schema, to reduce the number of elements interacting.

ICL is "concerned with the natural complexity of information that must be understood and material that must be learnt" (Sweller, 2010, p.124). ECL is "element activity that is caused by instructional factors and so can be eliminated by altering instructional procedures" (Sweller, 2010, p.136). ICL and ECL are determined by a combination of learning materials and learner characteristics (e.g. academic capabilities and established schema), but the emphasis is more on the characteristics of the material (Sweller, 2010, p.125). In contrast, germane resources (GR) refer to "the working memory resources that the learner devotes to dealing with the ICL associated with the complexity of information" (Sweller, 2010, p.126). GR focus on learner characteristics only. An increase in ECL may reduce the WM resources available to deal with ICL and hence may reduce GR (Sweller, et al., 2011). If element interactivity due to ICL is high, reducing the element interactivity due to ECL is critical as it can reduce the cognitive load to the manageable capacity of WM. If instruction is organised to allow WM resources to deal primarily with the elements that impose ICL, then learning is maximised.

Past literature has not explored the link between CLT and individual learner intelligence or academic ability. However, there is a body of psychology literature that shows a positive relationship between intelligence and working memory (see Colom, Abad, Rebollo, & Shih, 2005; Conway, Cowan, Bunting, Therriault, & Minkoff, 2002; Dang, Braeken, Colom, Ferrer, & Liu, 2014; Engle, Tuholski, Laughlin, & Conway, 1999). If WM is larger then a learner will be able to increase GR if required and hence increase learning. Also, if a learner has demonstrated a higher level of academic ability in prior learning (such as through meeting a higher admission standard) they will have partly done so through establishing better schema in long term memory from past study. To the extent that those schema are relevant to a new area of learning they will be able to use those established schema to reduce the number of elements in the new learning task and hence be less impacted by the limits of WM, resulting in a better learning outcome on the new learning task compared to a learner who demonstrated lower academic ability in similar prior learning. A higher demonstrated level of academic ability in prior learning is expected to also be positively correlated with intelligence; hence such a learner would be expected to have the advantage of both greater WM as well as better existing schema.

In the context of the accounting discipline, to achieve the overall objective of accounting education, accounting courses at the higher education level include a set of subjects to develop students' technical and professional skills (International Federation of Accountants. (IFAC), 2017). The levels of CALP vary due to the learning content and assessment of different accounting subjects. EFL students who are proficient in conversational English language (i.e. Basic Interpersonal Communicative Skills, BICS, according to Cummins, 2000) do not automatically have the necessary CALP to learn discipline-specific content (Cummins, 2000; Sweller, 2017). From a CLT perspective, the explanation for EFL students experiencing language-related learning difficulties are greater in MC subjects than LC subjects can be related to the different level of element interactivity involved in MC and LC. The academic tasks related to LC may be difficult because of the quantity of elements (e.g. formula, calculations). However, there are fewer tasks related to intensive reading, academic writing, synthesising literature, presenting arguments, and exercising professional judgements. Thus, the individual elements in LC can be learned *relatively* independently of each other. In contrast, MC subjects focus especially on reading, articulating and presenting arguments, case analysis and professional judgements. They involve applying professional judgement, critical thinking and problem solving skills to individual and group activities. Thus, MC subjects involve a higher level of element interactivity than LC subjects.

In all accounting subjects EFL learners will face more language-related learning difficulties (and hence more cognitive load) than their ENL counterparts in the process of academic acculturation due to linguistic and psychological reasons (Johnstone & Selepeng, 2001). ENL learners have a linguistic advantage of learning to apply rules of syntax early in life and this leads to their ability to build schema in long-term memory, resulting in a reduced level of element interactivity (Sweller, 2017). In contrast, EFL learners, and less so ESL learners, are disadvantaged linguistically, resulting from their unfamiliarity with, and therefore confusion by, the different contexts in which English words are used either for discipline specific or conversational purposes (Benzie, 2010; Dafouz & Camacho-Miñano, 2016; Nation, 2013). Discipline-specific (technical) vocabulary includes "units denoting field-specific concepts and even the metaphors of a discipline or field" (Basturkmen & Shackleford, 2015, p. 88). However, EFL learners (and less so ESL learners) only have a fraction of the language learning
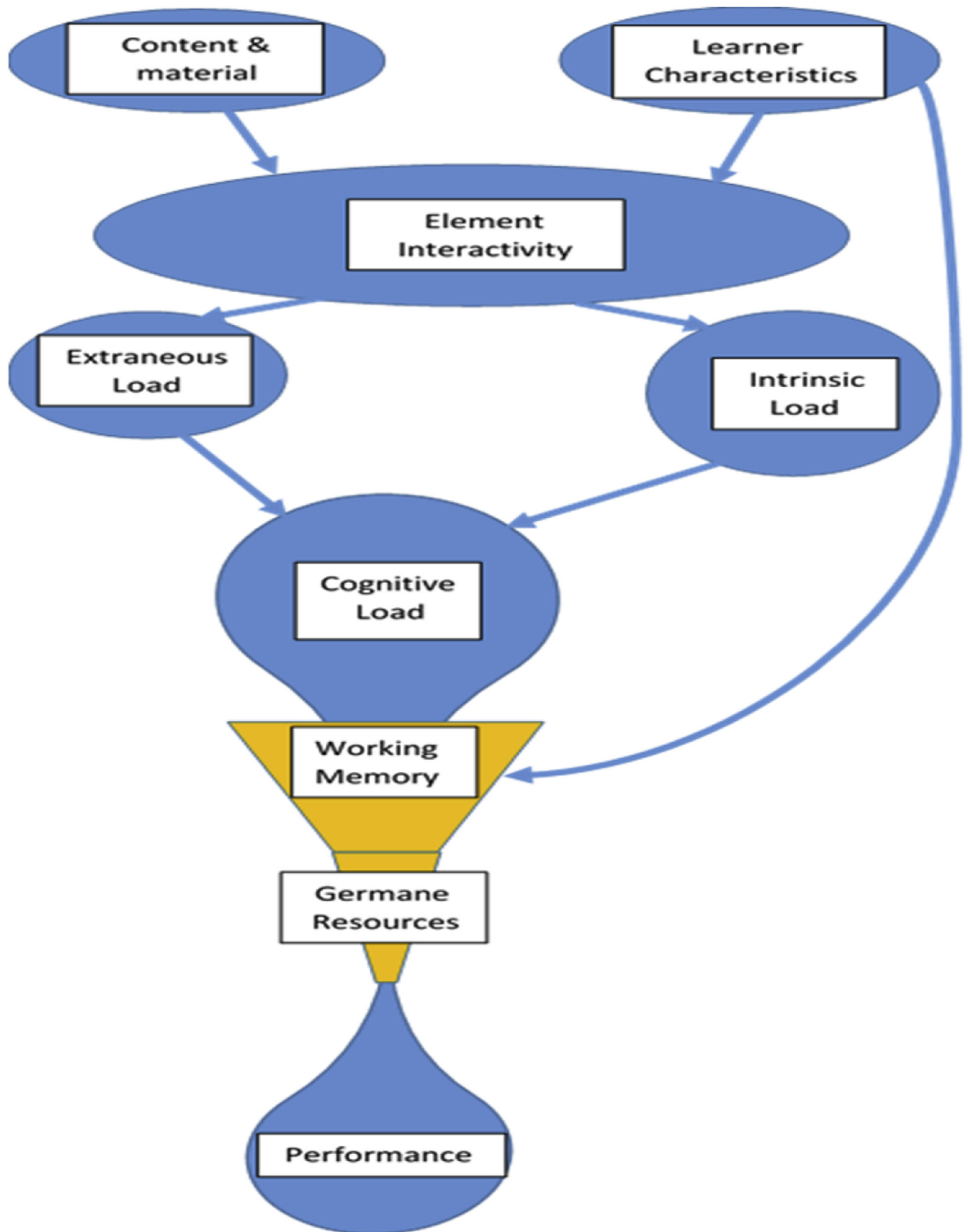
Figure 1. Cognitive load theory.

opportunities that ENL learners have access to, and have much less time for learning vocabulary than ENL learners, as explained in Nation (2013, p. 94). Yet, they need to read "unsimplified texts" and "compete" with ENL learners in the process of academic acculturation in English-medium universities. For example, prior studies found Western-style argumentation, written in English, is very challenging to EFL learners due to the "differences between the rhetorical structures in English and other languages" (Bacha, 2010, p. 230) and called for a more explicit and structured instruction approach to teaching EFL students in English-medium disciplinary studies. Similarly, Gablasova (2015) reported EFL learners had less precise and less elaborate disciplinary vocabulary knowledge (technical vocabulary) instructed in English medium, compared to first language learners.

Prior studies (Kern, 1994; Xiang, 2016; Yau, 2011) found EFL learners use mental translation as a cognitive processing strategy to locate an internal meaning system while attempting to comprehend English language. EFL students observed in the current study also reported the reliance on translation more in MC than LC subjects. While translation is an effective way to link short-term memory with long-term memory, it inevitably slows down the cognitive process for EFL and ESL learners. Hence, while the higher ICL of MC subjects applies equally to students of all language cohorts, ceteris paribus, the increased load from translation will impact EFL students, and to a lesser extent ESL students, more in MC subjects than LC subjects. Psychologically, EFL learners, and to a lesser extent ESL learners, are stressed out by failure to see meaning in texts because of the linguistic disadvantage. They "not only have to focus on what to say or what is being said, they also have to focus on how to say it or how it is being said" (Nation, 2003, p. 3). For example, Jackson (2004) reported that the fear of making mistakes limited Chinese EFL students' ability to perform in English-medium case studies in a Business faculty based in Hong Kong. As Roussel, Joulia, Tricot and Sweller (2017, p. 70) argued, "Without any foreign language instructional support, learning academic content through a foreign language" (English) for EFL learners "is likely to lead to sub-optimal results".

Therefore, both linguistic and psychological effects increase the CL of EFL students, and to a lesser extent ESL students, and put them at a disadvantage when compared with ENL students (with similar academic capability). This leads to the following proposition.

> *Ceteris paribus, there is a moderating effect of learners' proficiency in the language of instruction and assessment on the relationship between the complexity of materials and students' performance.*

4. Research design and data analysis

4.1. Data collection

Students' results were collected from AU's student management system. The sample used is all students who have results in all six accounting specialisation subjects between 2007 and 2014. Based upon the feedback from students and teaching staff, and an evaluation of the curriculum and assessment in each subject by the authors (based on the hard and soft characteristics of subject matters in the context of the applied accounting discipline discussed in Section 2), this study categorises accounting specialisation subjects at AU into MC and LC subject groups. MC subjects include accounting theory and auditing (soft applied dimension), and LC subjects include corporate finance, financial accounting, corporate accounting, and management accounting (hard applied dimension). Both MC subjects are third year and three LC subjects are second year and one third year. To maintain external accreditation by accounting professional bodies, each accounting specialisation subject at AU has the equivalent subject content and assessment tasks across onshore and offshore campuses. Each subject is coordinated by an accounting academic appointed by AU (known as unit coordinator). A unit coordinator is responsible for the curriculum design, including setting internal assessments and final examinations. The coordinator is also responsible for marking moderation to ensure the consistency of marking across all campuses. The way that the accounting program is managed at AU and its offshore campuses enables comparative analyses of learners of different language user groups which prior studies lacked (Dafouz & Camacho-Miñano, 2016).

Students are grouped into three categories based on the country of origin. The country of origin strongly aligns with English language user groups. In the Australian student cohort 60% of students speak English only and 82% have English as their first language. In the Chinese student cohort all students are selected from the Chinese secondary school system and have Chinese as their first language. While interaction with these students and their performance on English language tests would suggest otherwise it is possible that there was a small number of ESL students in this cohort. The Malaysian student cohort is mainly ethnic Malay, Chinese, or Indian students from Malaysia, although there are a small number of non-Malaysian students mainly from Indonesia, China and India. The Malaysian students complete their secondary schooling mainly in Bahasa (the official Malaysian language) with some subjects taught in English. Because of its colonial history English is widely used as a second language in Malaysia.

While each country cohort is some combination of ENL, ESL and EFL students each cohort is also dominated by one of the English language groups, i.e. China origin (EFL), Malaysia origin (ESL), and Australia origin (ENL). The cohorts were not "cleansed" to be pure EFL, ESL and ENL because this data was not available to the authors and could not be sought from the students since they had all graduated at the time the data was collected. This research therefore is premised on the fact that the Australian cohort will behave most like a pure ENL cohort, the Malaysian cohort most like a pure ESL cohort and the Chinese cohort most like a pure EFL cohort. To the extent that each country cohort is not wholly aligned with one English language cohort there will be a slight reduction in the discriminatory power of the tests compared to fully differentiated

Table 1
Summary of English Language User Group.

Group	Number of students
China Origin – Mainly English as a Foreign Language (EFL)	676
Malaysia Origin – Mainly English as a Second Language (ESL)	837
Australia Origin – Mainly English as a Native Language (ENL)	1399
Total	2912

English language groups, but this will increase the weight of any significant differences found. Only if no significant differences are found are questions then raised by the lack of full differentiation of the English language groups. See Table 1 Summary of English Language Users Group.

4.2. Empirical analysis

This study adopts a crossover repeated measures design to address several limitations in prior studies. First, prior empirical studies focused on English language proficiency solely, without controlling for the other factors that can affect students' performance (such as students' academic capability at admission, gender, socioeconomic status, or parents' level of academic achievement). This risks the results of these studies being open to criticism for confounding the influence of language with other factors. While learners' prior knowledge of English language is essential to the performance of students (Hartnett, Römcke, & Yap, 2004; Rankin, Silvester, Vallely, & Wyatt, 2003) controlling for it alone is not sufficient. Other learners' characteristics must also be controlled for.

Another issue is the measurement of student performance. Researchers commonly combine the average results across multiple subjects in a course. This presents a serious issue because it ignores the differences in grade distribution by subject and the different complexity of subject materials, and risks results being misleading and incomplete. Consistent with CLT, the crossover repeated measures design allows control for other learner specific characteristics, including working memory and academic ability but not language, to examine the impact of language on students' performance. It does this by matching a MC result to the control value of a LC result from the same student. Table 2 report the raw average marks in MC versus LC and Table 3 the average rank in MC versus LC across the three language groups. Statistical analysis was conducted using SPSS v24.

Table 2 shows that in absolute terms the EFL cohort is the best performing cohort in both groups of subjects, with the ESL cohort always the second best performing and the ENL cohort the worst performing. This highlights the risk of making such raw score comparisons when analysing the impact of language. As explained in section 3 and further elaborated in this section, the different performance can be seen as being partly a result of the differing admission levels for the language cohorts.

What it highlights is that to correctly compare the impact of language background it is important to first control for academic ability at admission, along with other student specific characteristics. In this study this is done by concentrating on

Table 2
[a]Comparison of raw average marks for MC versus LC across language groups.

Group	Av Mark in all subjects	Av Mark in LC subjects	Av Mark in MC subjects	Mean Diff LC to MC	SE of Mean Diff LC to MC	t-value for Mean Diff LC to MC	p-value	Cohen d
China Origin – Mainly English as a Foreign Language (EFL)	67.05	69.98	61.19	−8.79	0.296	−29.72	0.000	−1.143
Malaysia Origin – Mainly English as a Second Language (ESL)	61.29	62.78	58.31	−4.47	0.213	−21.01	0.000	−0.726
Australia Origin – Mainly English as a Native Language (ENL)	58.56	59.67	56.34	−3.33	0.195	−17.09	0.000	−0.457

[a] Each student's result in each subject comprises summative and formative assessments which give a total of 100 marks, with a minimum of 50% of the assessment weighting from an invigilated final examination.

Table 3
Comparison of average rank in MC versus LC across language groups - full cohort.

Group	Average Rank in All subjects	Average Rank in LC subjects	Average Rank in MC subjects	Ratio of Average Rank in MC Divided by LC
China Origin – Mainly English as a Foreign Language (EFL)	1018.2	935.6	1183.4	1.265
Malaysia Origin – Mainly English as a Second Language (ESL)	1456.3	1459.3	1450.2	0.994
Australia Origin – Mainly English as a Native Language (ENL)	1668.4	1706.5	1592.3	0.933
Total	1456.5	1456.5	1456.5	1.000

only relative results rather than absolute results and using a crossover repeated measures design where crossover of the specific characteristics of each student is achieved by having both a LC rank and a matching MC rank for the same student, i.e. a repeated (second) measure for the same student.

In each language cohort the absolute average result for MC is lower than for LC (the difference is found to be statistically significant in each group at the 1% level using a matched pairs t-test, with details shown in Table 2). This is consistent with the performance of students declining as the complexity of content increases (i.e. higher level of ICL), irrespective of language background.

A second issue that must be dealt with when combining results across multiple subjects is differences in grade distribution by subject, especially spread of marks. Therefore, to allow for differences in grade distribution between subjects the basic unit of measurement should not be raw mark, as commonly used in extant literature, but rather some alternative such as rank in each subject (as used in this study with the highest performing student given a rank of 1). An alternative would be to use standardised marks but this would still allow undue influence from extreme marks, especially extreme fails. Each student in each subject is ranked against all other students in the same subject, irrespective of language background. Each student has six ranks in six subjects and from this an average rank in the LC subjects and an average rank in the MC subjects, as well as for all subjects, is calculated for each student. This gives three series across all students, one for each of LC, MC and all subjects.

For each language cohort of students (ENL, ESL and EFL), the ranks for all students in that cohort can be added and an average rank for the cohort can be calculated. This can be done separately for each of the LC group of subjects, the MC group of subjects, and the overall group of all (LC and MC) subjects. The results of this analysis are shown in Table 3.

To control for overall academic ability and the mix of other specific student characteristics of students in each cohort, and differences in grade distributions across subjects, a *relative* measure of performance between LC and MC subjects based upon ranks is adopted. This is possible because of the use of a crossover repeated measures design. For a given student their *relative* measure of performance (the ratio of MC to LC rank) indicates how the student ranks in the MC subjects relative to how they rank in the LC (control) subjects. A relative score of one indicates the student ranks at the same level in both subject groups whereas a score of 1.10 indicates the student ranks 10% worse in the MC subjects than in the LC subjects. Alternatively a relative score of 0.8 indicates that the student ranks 20% better in the MC subjects than in the LC subjects. The analysis is done by taking, for each cohort, the ratio of the average rank in the MC subjects and dividing it by the average rank in the LC subjects. The results for this are also shown in Table 3. If performance across MC and LC subjects in each English language group was determined solely by academic ability, or by the mix of other specific student characteristics, the ratio for all groups would be expected to be 1.0 because academic ability and other student specific characteristics are controlled for through the crossover repeated measures design.

If language background has different influences on the learning of more conceptual versus less conceptual material then, ceteris paribus, the ratio of these numbers is expected to differ across language cohorts. The ratios are found to be significantly different at the 1% level between each group using a Mann–Whitney test (see details in Table 4). From Table 3 it can be seen that the results support the proposition that less past exposure to English increases the effort (CL) of learning more conceptually difficult material.

While the results support the proposition, they are not conclusive because of the ceteris paribus assumption. While the crossover repeated measures design controls for many characteristics that are learner-specific it does not control for whole of cohort influences that may differ across groups beyond English language background. One such factor is differences in secondary education systems. The secondary education system the student cohort was exposed to may influence the cohort's mix of academic skills when entering the course. For instance if the Chinese system placed greater emphasis on numerical and mathematical skill development over critical thinking skill development relative to the Australian system this would also support results in a similar direction to those found between the EFL and ENL cohorts. There is evidence that such differences do exist (Tian & Low, 2011). One measure of the possible magnitude of such an effect is the results of the OECD Program for International Student Assessment (PISA). PISA measures performance of 15 year olds on tests for both mathematics and reading (in their native language) ability across many countries. The 2015 PISA results for Australia, China and Malaysia

Table 4
Details of Mann–Whitney Tests.

Group	Average Rank China	Average Rank Australia	Average Rank Malaysia	Mann–Whitney U	p-value
China versus Australia	808.54	1148.88		317746.5	0.000
China versus Malaysia	644.57		847.81	206902.0	0.000
Australia versus Malaysia		1148.80	1067.86	543096.5	0.004

Table 5
OECD Mathematics and Reading PISA results for Australia, China and Malaysia.

Country	Mathematics	Reading	Ratio Reading/Mathematics
Australia	504	512	1.01
China	613	570	0.93
Malaysia	421	420	0.97

Table 6

Comparison of average rank in MC versus LC across language groups – LC and MC studied in Australia cohort.

Group	Number of Students	Average Rank in All subjects	Average Rank in LC subjects	Average Rank in MC subjects	Ratio of Average Rank in MC Divided by LC
China Origin – Mainly English as a Foreign Language (EFL)	406	625.9	552.4	772.9	1.399
Malaysia Origin – Mainly English as a Second Language (ESL)	75	665.1	667.7	659.9	0.988
Australia Origin – Mainly English as a Native Language (ENL)	1399	1046.6	1067.7	1004.2	0.940
Total	1880	940.5	940.5	940.5	1.000

(OECD, 2016) are shown in Table 5 along with the ratio of Reading to Mathematics scores. The ratio shows that Malaysia is halfway between Australia and China in terms of the mix of numerical/mathematical abilities versus conceptual/reading abilities. While the rankings in Table 5 are consistent with those in Table 3, the magnitude of the differences is not. This suggests such differences in secondary education systems would not fully explain the results in Table 3.

Another potential confounding issue is that not all students have been taught by the same staff. The offshore partners employ their own staff who teach part of each subject, the other part being taught by visiting AU staff. To assess the impact of this a supplementary analysis was done where all cohorts were limited to students who studied the MC subjects at an onshore campus with the same teachers. This analysis found a similar pattern of relative performance across language cohorts suggesting the original results were not driven by differences in teaching staff (see Table 6).

In summary the results in Table 3 show that on average EFL (Chinese) students perform 26.5% worse on rankings in MC subjects compared to LC subjects than would be expected if both results depended solely on academic ability and other student specific characteristics. Even allowing for the apparent greater emphasis of about 8% on mathematical skills versus reading skills in the Chinese secondary education system compared to the Australian system there still appears to be a significant drop in performance that can be attributed to language issues. The results in Table 3 also show only a small difference between ESL (Malaysian) and ENL (domestic) student cohorts, much of which appears to be explained by the results in Table 5. Hence, while there is evidence of ESL students performing slightly worse than ENL students for language reasons the evidence suggests ESL students are much closer to ENL students than EFL students in terms of the impact language has on their study.

It is noted that the findings of this study on the academic performance of Chinese international students when compared with Australian local students appears to contradict the findings reported in Chand, Cheung, and Cummings (2015), where they reported Chinese international students performed worse than Australian local students. The main explanation for this is the failure to control for academic ability at admission in that study where raw marks are used. As explained in Section 3, students who have already displayed greater academic ability have the advantage of both greater working memory and established schema. This would predict higher performance in on-going study ceteris paribus. In AU this effect favours EFL, and to a lesser extent ESL students whereas in most Australian universities the stronger cohort is domestic students. Hence, at AU the positive academic ability effect for EFL students is partially offset by the negative language effect shown in this article whereas in articles like Chand et al. (2015) any negative language effect is compounded and confounded with a negative academic ability effect for EFL students. Another issue with Chand et al. (2015) is that by using only results from an accounting theory based subject, they measured the most extreme impact of language on the academic performance of Chinese international students (as opposed to choosing a LC subject). Therefore, failing to control for academic ability and other factors (see, for example, academic discourse socialisation as in Benzie, 2010; also see Dafouz & Camacho-Miñano, 2016) exposes such studies to questions about the validity of their findings.

5. Conclusion

To the authors' best knowledge, this study is the first to connect CLT with academic capability and intelligence in explaining learners' academic performance. It extends the application of CLT in language-related learning problems of EFL learners in the context of the accounting discipline. The findings of this study strongly support the use of CLT as an analytic framework to understand the variations in language-related learning difficulties of students from different English language backgrounds in studying the accounting discipline. The findings reveal that EFL learners have a strong relative disadvantage in doing MC (soft applied) subjects versus LC (hard applied) subjects due to the cognitive load resulting from linguistic and psychological effects. This study helps to address a common misconception about the reasons for rote learning of EFL (e.g. Chinese) international students (Heng, 2018; Kember, 2000), especially for subjects that are more in the soft applied dimension (Biglan, 1973) of an academic discipline in Western universities. The perceived rote learning of Chinese students could be resulting to some degree from the fact that Chinese students lack the discipline-related vocabulary to communicate clearly in subjects that require a higher level of CALP. They have to memorise the difficult vocabulary without relating it to their long-term memory of prior knowledge and then regurgitate it in their writing or speaking in reading and writing intensive subjects (or programs). This issue is explained in detail in Sweller et al. (2011, p. 64):

Learning with understanding always increases the number of interacting elements that must be processed in working memory. For all of us, under at least some circumstances, the increase in element interactivity and working memory load associated with understanding information may be too large to handle. Learning by rote without understanding may be the only viable option.

Empirically, this study provides the first quantifiable evidence about the extent to which English language user groups (EFL, ESL, and ENL) have different influences on the learning of MC (soft) subjects versus LC (hard) subjects in the accounting discipline. The extensive data analysis of this study helps us to gain a better understanding of the impact of language on the academic performance of EFL international students in English-based accounting programs. The use of the crossover repeated measures design with a ratio[2] has overcome the current limitation of much research not controlling for other predictors of students' performance (e.g. academic capabilities, gender, socioeconomic status, or parents' level of academic achievement). The use of rank in MC and LC subjects to measure students' performance has also effectively addressed the limitation of using raw marks in some of the current literature that fails to account for the different grade distributions across multiple subjects.

This study promotes interdisciplinary teaching and research collaboration in developing strategies to improve the learning experiences of EFL students in accounting and other disciplinary areas (for example medicine in Atai & Fatahi-Majd, 2014).

This study is based on one Australian university's data. Therefore readers should be prudent in generalising the findings. Future research can include more English-based universities from other countries. The findings of this study point to more questions to be investigated in future. For example, how to reduce the cognitive load resulting from translation and stress by improving the instructional design in English-based academic programs? Many current instructional practices are dominated by English language as the monolingual instructional language in English-based accounting courses. They "routinely ignore" the principles of "educational psychology and human cognitive architecture" (Sweller, 2017, p.9). One suggestion to improve instructional design is to consider bilingual/or multilingual instruction (see van de Walt, 2013). There has been a growing research literature, primarily in applied linguistics research, recognising the effectiveness of the use of EFL learners' own language and translation in English-based classrooms (see Cook, 2010; Palfreyman & Van de Walt, 2017). For example, Cummins (2005, p.1) rightly points out "it is useful to explore bilingual instructional strategies for teaching bilingual students rather than assuming that monolingual instructional strategies are inherently superior". Proponents of bilingual/multilingual instruction argue that the use of EFL learners' own language reduces the cognitive load of tasks by reducing the demands on learners' working memory and facilitating cognitive processing (e.g. Cummins, 2007; Kern, 1994). Bilingual proficiency theory (Cummins, 1992), and the recent development on multilingual pedagogies in higher education (Palfreyman & Van de Walt, 2017; van de Walt, 2013) suggest that CALP between first language and foreign language can be transferrable. Therefore, bilingual/multilingual instruction should have the potential to help EFL (and ESL) students to better connect the new accounting knowledge handled in WM with their long-term memory (much of which will be stored in their first language). Bilingual/multilingual instruction would enhance meaningful learning by reducing the number of elements handled by WM. Future research can empirically examine the impact of bilingual/multilingual instruction on the learning efficiency of EFL learners in English-based academic disciplinary areas.

A further improvement could be made in future research methodology by replicating the study using "pure" EFL, ESL and ENL cohorts by either having language background data as part of the initial data collection or by surveying the students about their language background while they are still enrolled. This would improve the ability of the test to discriminate between groups, which was not found to be an issue in this study since the groups were already found to be significantly different.

Acknowledgements

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.esp.2019.03.003.

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[2] As opposed to the more conventional approach of considering the difference between the values of the two variables being compared. This is done to control for the variation in average LC rankings across the three groups.

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