

How to assess the effectiveness of accounting education interventions: evidence from the assessment of a bridging course before introductory accounting

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Abstract

Purpose – This study aims to provide a thick description of a four-day bridging course in introductory accounting presented before the start of a student's first year. The course aims to address the lack of prior accounting knowledge. The study also evaluates the effectiveness of the course using econometric techniques. Treatment effects are considered when interpreting the results.

Design/methodology/approach – This voluntary intervention used a quasi-experimental research design and quantitative techniques, including the application of propensity score matching (PSM), to isolate the treatment effect on the treated and untreated groups.

Findings – A positive and significant association is reported between attending the bridging course and performance in the first assessment.

Research limitations/implications – A bridging course in accounting offers higher educators an opportunity to ensure that students are academically better prepared when entering university. This course provides adequate prior knowledge from which a student will benefit during the first assessments, which may contribute to increased self-efficacy and retention. This intervention has social implications for students as they can interact, participate and easily transition from school to university. Social implications include learning communities that are formed at the onset of their studies.

Originality/value – Bridging courses have been presented in other disciplines with positive results but not yet in accounting. Bridging courses in accounting are viable interventions to address gaps in prior knowledge and assist with the transition from school to university. This study expands literature by demonstrating the application and interpretation of PSM in quasi-experimental designs.

Keywords Bridging course, Pre-university courses, Introductory accounting, Propensity score matching, Treatment effects, Course evaluation, Quasi-experiments

Paper type Research paper

Introduction

Bridging courses have been used with great success in other disciplines but have not received much attention in accounting education literature. This study provides a thick description of a four-day bridging course presented to first-year students (with no prior accounting knowledge)



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before the start of the formal academic year. The course aims to address the lack of prior accounting knowledge and addresses common issues reported during the transition from school to university. This paper also evaluates the effectiveness of the bridging course by using quantitative analyses which are interpreted according to treatment effects.

Globally, higher education has undergone a transformation during the last century: from being an “elitist” system (0%–15% participation), to becoming a universal participation system with participation rates of more than 50% (Fallis, 2015). In sub-Saharan Africa – a region with the lowest participation rates in higher education in any world region (Mohamedbhai, 2014) – South Africa managed to increase this rate from 15% in 2000 to 24% in 2019 (World Bank, 2021).

Although more students participate in higher education, students’ preparedness to enter higher education is questionable. Reports from across the globe indicate various challenges in education systems, more over in developing countries. Unsatisfactory retention rates and poor completion rates are exasperated by poverty, inequality and unemployment. Academic preparedness of socio-economically disadvantaged students is much lower (OECD, 2015a, 2015b) with below average performance in reading and mathematical skills. In addition to these existing challenges, it is estimated that 23.8 million school and university learners will not return to academic institutions to complete their studies after the COVID-19 pandemic (Szmigiera, 2022). Although statistics from countries such as the USA and UK indicate overall satisfactory retention and completion rates, minority groups in these countries face challenges similar to those confronting societies in developing countries (Irwin *et al.*, 2021; Wiseman *et al.*, 2017).

Increased participation rates put pressure on universities to achieve better throughput rates whilst accommodating a larger number of underprepared students. However, universities in developing countries do not have adequate resources to address academic deficiencies which result in underpreparedness. This leads to poor academic performance at university, which remains the main threat to retention at first year [Council on Higher Education (CHE), 2013]. South African public universities conduct teaching in less-than-ideal circumstances, including, for example, large class sizes in excess of 300 students per session in introductory accounting (total cohort of 1,500 students per semester) and a lack of resources to address academic problems. Many South African students come from rural and underdeveloped areas which exacerbates transition challenges; also, most of these students are first-generation students resulting in a lack of support from parents or caregivers. However, this study suggests an intervention to address underpreparedness within the context of introductory accounting whereby a student’s academic performance is increased and common issues in the transition from school to university are addressed.

Students who completed accounting at school will feel more prepared in an introductory accounting module, as research shows that prior knowledge of accounting is beneficial at tertiary level (Doran *et al.*, 1991) more so if there is an overlap between the accounting curriculum at school and the accounting curriculum at university (Van Rensburg *et al.*, 1998). On the other hand, students without prior accounting knowledge often perceive accounting as difficult to master (Dull *et al.*, 2015), leading to anxiety, low self-efficacy and even depression (Byrne *et al.*, 2014). Students know which courses are easily failed and this awareness negatively impacts self-efficacy (Sharma, 1997). Moreover, first-year students may underestimate the workload in accounting courses (Braun and Sellers, 2012) if they have no prior accounting knowledge.

This South African study is of importance to educators in developing countries and marginalised societies within developed countries. Even though this article is presented in a South African context, its findings and recommendations carry wider applicability to accounting educators and universities faced with similar constraints. It suggests that it is indeed possible to provide students (without prior accounting knowledge) with fundamental

accounting knowledge from which they can benefit in the form of increased academic performance. It also suggests features that should characterise an effective short course, such as the inclusion of reading, writing, arithmetic, study and critical evaluation skills.

Evaluation of any intervention or program is important to justify the investment of resources. Herein lies the second contribution of the study: quantitative methods were applied with the addition of an application and thorough description of propensity score matching (PSM) that will add to the development of robust analysis techniques in accounting education.

The remainder of this article is set out as follows: a brief literature review positions this study in theory. The thick description of the course provides the reader with content of the bridging course. A brief explanation of treatment effects allows the reader to understand the interpretation of the results. Thereafter, the research methodology used to evaluate the course is deliberately provided in as much detail as possible to encourage replication. Finally, this article concludes with the results and suggestions for future research.

Literature review

Bridging courses as academic interventions

Bridging courses, also known as pre-university enabling programmes (Lisciandro and Gibbs, 2016), university preparatory courses and pathway courses (Hodges *et al.*, 2013), are increasingly used in higher education to ensure students enter with the best possible chances of passing. As short, intensive courses, bridging courses address the gap between school and university. It does not only include content knowledge but assists students in developing learning strategies for a specific discipline and eases the transition from school to university (Gordon and Nicholas, 2013).

The use of bridging courses at the onset of a student's first year in mathematics (Gordon and Nicholas, 2013), sciences (Fraser *et al.*, 1990), nursing and medical training (McLaughlin *et al.*, 2017) and chemistry (Schmid *et al.*, 2012), is thoroughly documented. However, bridging courses in accounting before the start of an academic year have not received any attention in literature. Instead, accounting literature reports the use of videos and podcasts (Cameron and Dickfos, 2013), tutorials (Johnson *et al.*, 2009), supplemental instruction during the semester or year (Jones and Fields, 2001) or bootcamps (Jackson, 2014) as academic interventions.

This study's first objective is to provide a thick description documenting the content and pedagogy of a voluntarily attended four-day bridging course presented to non-accounting students before the formal start of their first year.

Impact of prior knowledge on performance in accounting at university. Using bridging courses, students can be introduced to fundamentals in accounting, providing students some form of prior accounting knowledge before the start of the formal year. Literature on the perceived benefits of prior accounting knowledge are inconclusive in terms of the perceived benefits of accounting at school, with some stating that it is beneficial to students (Doran *et al.*, 1991; Keef and Hooper, 1991; Schroeder, 1986), that initial benefits are eroded over time (Rowlands, 1988; Bartlett *et al.*, 1993; Xiang and Gruber, 2012) and that accounting at school is not beneficial to students at tertiary level (Koh and Koh, 1999; McDowall and Jackling, 2006).

For the purposes of this study and the current overlap between the South African school and tertiary curricula in accounting, it was accepted that prior knowledge of accounting is beneficial and consequently the first hypothesis is as follows:

- H1.* Bridging courses provide students with the benefit of prior accounting knowledge that is evident in their academic performance.

Evaluation of academic interventions

Literature is rife with reports on accounting interventions and aims to provide measures of its effectiveness. Table 1 presents a summary of some of the interventions included in accounting education literature. Analysis techniques ranged from comparison between groups to the application of ANCOVA and regression analyses.

From Table 1, it is evident that researchers mostly applied quantitative techniques to conduct programme evaluation. Programme evaluation inevitably borders on making causal inferences (Guo and Fraser, 2010). However, causality cannot be claimed in quasi-experimental designs as many observed and unobserved factors contribute to students' academic performance. One limitation of using quasi-experimental designs is that the *ignorable treatment assignment assumption* is violated since students cannot be randomly assigned. Ignorability is fundamentally untestable because only the treatment, control variables and outcomes can be observed (Wooldridge, 2010).

Although regression analyses include observable factors (control variables), the relation between outcomes and independent variables need proper specification to avoid functional form misspecification (FFM). FFM can lead to biased results and the prevalence of FFM

Authors	Intervention	Statistical method/measure
Etter <i>et al.</i> (2000)	Supplemental instruction	No statistical analysis compared groups.
Jones and Fields (2001)	Supplemental instruction	ANCOVA
Stout and DaCrema (2004)	Writing intervention	MANOVA and paired samples <i>t</i> -test
Johnson <i>et al.</i> (2009)	E-tutoring (artificial intelligence)	ANCOVA and Between groups comparison
Sargent <i>et al.</i> (2011)	Videos	Chi-squared test
Winfield and Luyt (2013)	Jumpstart (pre-university programme)	Chi-squared test
Jackson (2014)	Bootcamps	Propensity score matching
Powell and Singh (2016)	Plagiarism intervention	Paired samples <i>t</i> -test and comparison of means
Seow and Wong (2016)	Mobile gaming app	Qualitative analysis
Chan <i>et al.</i> (2016)	Educational computer program	Structural equation modelling
Bargate (2018)	Writing intensive tutorials	Interactive quality analysis
Taplin <i>et al.</i> (2018)	Short role-plays	Regression and paired samples <i>t</i> -test
D'Aquila <i>et al.</i> (2019)	Videos	Regression analysis
Beatson <i>et al.</i> (2020)	Mobile application (Quitch)	Hierarchical multiple regression
Bowen <i>et al.</i> (2021)	Gamification	Reported means of Likert scale questions
Bootsma <i>et al.</i> (2021)	Voluntary participation in service learning	Repeated measures ANOVA
Ainsworth (2021)	Team-based Learning in professional writing courses	Means comparisons (including difficulty factors and discrimination indexes)
Onumah <i>et al.</i> (2021)	Ethics education interventions	Regression analysis
Van Niekerk and Delpoit (2022)	Evolved flipped classroom design	Action research and qualitative data
Voshaar <i>et al.</i> (2022)	Gamified mobile learning application	Regression analysis

Table 1. Accounting interventions and analysis techniques

Notes: ANOVA = Analysis of variance and MANOVA = Multivariate analysis of variance

increases if the treated and untreated groups differ on more than one level (Rosenbaum and Rubin, 1983; Shipman *et al.*, 2017). When the ignorable treatment assignment assumption is violated, an ordinary least squares (OLS) regressions' estimate of the treatment effect is biased and inconsistent (Guo and Fraser, 2010). To mitigate this limitation, the OLS regression needs to be complimented with more analysis techniques. Even if robust analysis techniques are used, these results need to be interpreted by incorporating the treatment effects on groups of students. However, none of the studies included in Table 1 interpreted results by referring to treatment effects. Treatment effects are discussed in a separate section of this paper.

PSM mitigates endogeneity, as PSM aims to isolate the treatment effect by creating balanced groups. In recent years, the use of PSM has received more attention in accounting (albeit not accounting education) with an elaborate description of the benefits and use of PSM (Tucker, 2010; Shipman *et al.*, 2017).

This study's second objective is to provide a detailed description of the use of PSM to create balanced groups and the interpretation of results by incorporating treatment effects.

Predictors of success in accounting from prior literature

The following observable variables, used in this study's analysis, have been identified as significant predictors of success in introductory accounting:

- prior knowledge (Boshua and Van der Nest, 2015; Xiang and Gruber, 2012);
- academic aptitude (Seow *et al.*, 2014; Tickell and Smyrniotis, 2005);
- performance in mathematics (Boshua and Van der Nest, 2015; Seow *et al.*, 2014);
- gender (Seow *et al.*, 2014; Koh and Koh, 1999);
- motivation (Xiang and Gruber, 2012; Byrne and Flood, 2008);
- type of school (Tickell and Smyrniotis, 2005); and
- language of tuition (Tan and Laswad, 2008).

Motivation was included as a broad construct in prior studies; however, defined components of motivation are necessary, as these contribute uniquely to a student's learning experience. The question emerged as to which components of motivation will be specifically applicable to non-accounting students. Therefore self-efficacy (the self-belief of personal capacities (Bandura, 1977)), motivation to learn [1] and student motivation [2] were included as constructs of motivation that could affect academic performance.

Description of the intervention

Preparation for Tertiary Accounting (PTA) is presented in the form of a non-credit bearing, bridging course over a period of four days before the start of the academic year to students who do not intend to qualify as professional accountants (non-accounting students).

The development of PTA incorporated the following salient strategies: fostering self-regulated learning to develop life-long learners, the changing role of the facilitator (from teacher to lecturer) and the development of an environment that fosters belonging.

Self-regulated learning: developing lifelong learning

Lifelong learning is a mind-set of continuous skills development, acquisition of knowledge and solving new problems (Smith, 2001). First-year students need strategies to foster "learning to learn" skills to become lifelong learners, and these are developed through appropriate and deliberate intervention (Cornford, 2002).

Lifelong learning strategies were developed with Zimmerman's academic learning cycle (Zimmerman, 1998) as theoretical basis. This learning cycle consists of three phases. The *Forethought phase* involves motivation, beliefs and expectations students have when entering university.

The *Performance phase* involves the use of learning strategies to accomplish academic tasks (Becker, 2013) and these are categorised into rehearsal strategies (e.g. studying formats of financial statements according to IFRS); elaboration strategies (e.g. paraphrasing and summarising definitions); organisational strategies (e.g. planning how to answer a question); monitoring strategies (e.g. checking for comprehension failures) and affective strategies (e.g. examination techniques) (Weinstein and Mayer, 1983).

Zimmerman's learning cycle is concluded with the *Self-reflection phase*. During the self-reflection phase, students evaluate their performance based on the goal that was set. Normally this goal is a performance goal: either expressed as a score for an assessment, improvement on a prior score or as vague as "just passing the course".

During the four days at PTA, proven learning strategies that are recommended for the successful completion of an introductory accounting course, are discussed. However, it is important to afford students time to practically apply these strategies and thereafter, to reflect on the application of these strategies.

Facilitator's role: shifting pedagogies

The role of the facilitator alternates between a student-centred and a teacher-centred pedagogy, as proposed by Bonner (1999). This contributes to the learning experience of students on several levels: firstly, when students are expected to be active participants in their own learning (student-centred approach), they quickly observe how others can enhance their learning. Besides fostering respect and appreciation for others, this interaction between students is conducive to interdependence and social cohesion in the group.

Secondly, Bonner's strategy provides an opportunity to reflect on what was learned and how it is understood in a non-intimidating way. Students can test their own understanding by participating in discussions that take place during class. Finally, from the group discussion it emerges that more than one solution to the problem might be considered as applicable and correct. This enhances the principle-based teaching in accounting.

An environment that fosters belonging

Research suggests that discourses promoting independent learning should be cognisant to foster an environment that is conducive to conversations and open communication between students and staff. These conversations should include continuous discussions on transitions and how to adapt to higher education (Leese, 2010). A direct correlation between a sense of belonging and student retention has been established (Kift and Field, 2009). Due to the relatively small size of the PTA cohort, early engagement is fostered and participation in group work is encouraged which also contributes to a sense of belonging (Fischer, 2007).

During the transition from high school to university, students need support as they navigate the process from separation, transition and then incorporation (Tinto, 1988). Tinto (1988) recommends that students should be engaged within the first six weeks of the start of their first year to gain the maximum benefit from support. Academic and non-academic engagement is encouraged through the attendance of PTA. Social engagement between students foster belonging, and this is one of the reasons why PTA is offered as a face-to-face intervention as opposed to an online bridging course as an online bridging course might leave students feeling isolated (Rolf *et al.*, 2018).

		Preparation for Tertiary Accounting	
		Topic	Activity/Assessment
		Outcome for Day 1: The purpose of the first day is to emphasise the application of accounting in our everyday lives as well as the application of accounting in various “non-accounting” careers	
Day 1	Introduction by the lecturer. Discussion of differences between university and school: self-discipline, respect for others and taking responsibility for yourself Discussion of skills needed to study accounting, i.e. reading, paraphrasing, mathematical abilities, critical evaluation and reasoning and time management Introduction to research, academic journals and referencing style	Students are encouraged to become co-creators of learning. The first step is to identify house rules for “us” for the duration of PTA	
	Revision of mathematical ratios Making a profit: one of the reasons for doing business Revision of mathematics: unknown factors What is a financial period?	Brain teasers are given to students as an ice breaker. The purpose – developing critical thinking skills – is explained. Students form informal groups to solve the brain teaser	Individual assessment (should be completed after class): reading an academic article on the history of Accounting (Sangster, 2010). Answer short questions and reflect on the article. Consult other academic sources (not Wikipedia) with the application of the referencing style commonly used at the university Class activity (individual) Class activity: calculations using gross profit percentages
	What is Accounting?	Class activity	Class activity: preparing timelines and how to use timelines in solving Accounting questions Internal vs External users; different types of Accounting; an introduction to the accounting cycle. What is IFRS and a discussion on the Conceptual Framework and its purpose. Examples of source documents and different transactions are discussed
Day 2	Outcomes for Day 2: The purpose of Day 2 is to explain the double entry principle to students by making use of the definition and recognition requirements contained in the Conceptual Framework. Effort is made to “demystify” the jargon that is entailed in the definitions by making use of a lot of class discussions during which examples for the elements are discussed. Students are required to form groups of not more than four members per group. Ideally group members should be enrolled for the same degree programme. Activities undertaken on Days 2 and 3 will be in the form of a competition. Marks for group assignments as well as points scored in the activity on the last day will be used to decide the winning team. Group assignments are completed after the contact session, on campus. The venues are reserved for these students’ exclusive use. The lecturer is also available on campus for one-on-one consultations if students need assistance with any content The conceptual framework: definition and recognition requirements		Students are required to, in their groups, classify items according to the elements of the Accounting equation. Class activities are marked in class so students receive immediate feedback and have the opportunity to reflect on their learning
	Explanation of the Accounting equation and the double entry principle		Various class activities provide students the opportunity to collaborate as a group in class. The analysis of transactions (according to its effect on the Accounting equation) are done extensively

(continued)

	Topic	Preparation for Tertiary Accounting Activity/Assessment
	Integration of Accounting skills and knowledge: case study	A second group assignment is given in the form of a case study. Part 1 of the case study is the analysis of transactions according to its effect on the Accounting Equation. The difference between this case study and the other assignments is that the type of transactions and activities included in the case study simulate a real-life business and it is, therefore, more authentic. Some of the information in the case study is ambiguous, unclear or inadequate. This is by design and its purpose is to stimulate critical thinking. Students are encouraged to obtain assistance from various sources, including the lecturer, textbooks or the internet. Students are also encouraged to teach each other. This assists in fostering a learning community
Day 3	Outcomes for Day 3: The purpose of Day 3 is to explain the purpose of source documents as well as the purpose of various subsidiary journals Accounting cycle	The Accounting cycle is explained and discussed in detail. Class activities are done in groups with the lecturer as the facilitator. Students are encouraged to ask for assistance and to overcome barriers of learning in this way
Day 4	Outcomes for Day 4: The purpose of Day 4 is to complete the Accounting cycle. Posting to the general ledger, preparing a trial balance and preparing elementary financial statements for sole proprietors from part of the learning outcomes for this day Posting to the general ledger Preparing a trial balance Preparing the statement of profit or loss and other comprehensive income as well as the statement of financial position (elementary statements without the accompanying notes) Close of PTA and integration	The column totals of the subsidiary journals in the suggested solutions of the case study are used to complete the general ledger Based on the previous activity, the accounting process is continued by preparing a trial balance from the general ledger that was just done The trial balance is used to prepare the two basic financial statements for the entity used in the case study. A class discussion is facilitated through which the statements are interpreted PTA is closed off by playing a betting game which provides groups a final opportunity to earn points. The objective of the game is to build a structure from recycled material that can catch an egg when the egg is dropped from a height of about 1.7metres above ground. Each group receives the same amount of virtual money. Each group has to appoint a treasurer and a bidder Groups get the opportunity to bid for items (such as rubber bands, newspapers, toilet rolls, plastic bags, masking tape, paper boxes etc). The highest bid for a single item wins. Prices paid are subtracted from the group's virtual bank balance After bidding has closed, the group plans what will be used to build the structure. Excess goods are put up for public auction. In this phase groups can also bid to buy items from one another, but the money goes to the seller and is subtracted from the buyer The last phase entails building of the actual structure. A fresh egg is dropped on each structure. If the egg is undamaged, the group scores a point. If more than one group succeeded, the group with the highest bank balance wins The winners of the final phase gets a point and this is added to the marks obtained throughout group assignments. The winning group is announced and walks away with a prize

Understanding treatment effects

The limited number of prior studies in accounting education conclude that interventions are effective (Jones and Fields, 2001; Domina, 2009; Jackson, 2014), but the association between programmes and academic improvement has not been interpreted by incorporating the treatment effects on different groups of students. This section provides a discussion on treatment effects and how that is used to interpreted results after the evaluation of an intervention.

A population of students can be divided into four different groups: “defiers”, “compliers”, “always-takers” and “never-takers” (Angrist *et al.*, 1996). Figure 1 contains a summary of the definition of each of these groups of students.

When conducting program evaluation, the treatment effect on the “compliers”, “defiers” and “never-takers” are of interest. However, only the “compliers” received the treatment and other groups, who were eligible for and assigned for treatment, did not. Different analysis techniques are required to estimate the treatment effect on each group of interest. Therefore, the interpretation of the results will depend on the specific treatment group that was evaluated.

The average treatment effect (ATE) is the effect of treatment on all four groups. The ATE can be estimated using ANCOVA or OLS regression analysis (Shipman *et al.*, 2017). One of the disadvantages of estimating ATE is that its effect is averaged across the population, including those subjects who were not eligible for the treatment (for example more motivated, performing students). Therefore, this analyses method should be coupled with more econometric analysis techniques to render results as generalisable.

The average treatment effect on the treated (ATT) involves participants of all the groups that received treatment; i.e. “compliers” (assigned and were treated); “defiers” (assigned to the control group, but received treatment) and the “always-takers” (not assigned to treatment, but received treatment). This treatment effect can be estimated by using PSM. A limitation of using PSM is due to the difference between the ATE and the average treatment effect on the treated (ATT). Therefore, the results of propensity score (PS) regressions can arguably only be generalized to those receiving the treatment. The effects of treatment between the ATE and ATT groups overlap due to randomisation if one assumes that the population in general is not systematically different from the treated group (Austin, 2011).

To determine the treatment effect on the “compliers”, literature suggests the use of the local treatment effect (LATE). This method usually involves the application of an instrumental variable in the Heckman procedure. This is included as suggestions for future research.

Defiers	Compliers	Always-takers	Never-takers
<ul style="list-style-type: none">•Subjects do the opposite of their treatment assignment.•If assigned for treatment, they form part of the control group.•If assigned as the control group, they receive treatment.	<ul style="list-style-type: none">•Subjects are eligible for treatment.•Subjects participate where assigned.	<ul style="list-style-type: none">•Subjects are assigned to the control group (don't need the intervention).•Subjects participate in treatment in any way.•Expected to be more motivated to learn than other groups.	<ul style="list-style-type: none">•Subjects are assigned to treatment (they need intervention).•Subjects will never take treatment, even if they were assigned for treatment.

Figure 1.
Summary of the four
subgroups in a
student population

Research method

Objective and hypotheses

This study has two objectives: first, to provide a thick description documenting the content and pedagogy of the bridging course and second, to provide a detailed description of the use of PSM to create balanced groups and the interpretation of results by incorporating treatment effects.

Further to this, a hypothesis was developed to evaluate the effectiveness of the intervention:

H1. Bridging courses provide students with the benefit of prior accounting knowledge that is evident in their academic performance.

Sample selection. Approximately 1 600 prospective first-year BCom students received information on the bridging course via emails two months before the start of the formal academic year. This information included details of what the bridging course aimed to achieve, logistical arrangements (time and venues) and the costs involved of attending the course. It also stated that attendance of the non-credit bearing course was voluntary. No selection criteria were applied and therefore the course attendees included students with or without prior accounting knowledge. Course attendees included students across racial groups, from diverse backgrounds and multiple languages.

Students who attended PTA formed the treatment group (n = 87) of which 84% (n = 73) did not complete accounting at school,

The control group was formed by students who enrolled for the formal course presented during the academic year, but who did not attend the bridging course (n = 671). Thirty nine percent (n = 258) of students in the control group did not complete accounting at school. These students were invited to partake in the research study after the appropriate ethical clearance was obtained from the university. No academic credit, monetary incentive or non-monetary incentives were awarded to any participant.

Research design

This study was conducted following a quasi-experimental design. To control for a possible facilitator's effect, the bridging course and formal course from which the control group was formed, were facilitated by the same lecturer. This lecturer was not involved in setting assessments for the formal course.

The research was conducted in two separate analyses:

- (1) a main regression analysis (using the entire group); and
- (2) the regression with a more balanced group (a group matched according to propensity scored matched values).

Exploratory ordinary least squares regression (entire group). Several variables were included in the regression analysis and were chosen based on prior literature:

$$\begin{aligned}
 \text{Performance} = & \beta_0 + \beta_1 \text{Course}_i + \beta_2 \text{APS}_i + \beta_3 \text{AccSch}_i + \beta_4 \text{MathMark}_i \\
 & + \beta_5 \text{LearnSE}_i + \beta_6 \text{Gender}_i + \beta_7 \text{Age}_i + \beta_8 \text{SameLang}_i \\
 & + \beta_9 \text{School}_i + \beta_{10} \text{StudMot}_i + \beta_{11} \text{MotivLearn}_i + \varepsilon
 \end{aligned} \tag{1}$$

Table 2 shows the independent variables and codes used.

Exploratory ordinary least squares regression: PSM (balanced group). Self-selection bias was addressed by applying two strategies. First, to mitigate for an anticipated difference in

motivation levels between attendees and non-attendees, proxies for motivation of three constructs (motivation to learn, learning self-efficacy and student motivation) were included. Second, a propensity score was calculated for each subject. Attendees were matched with like non-attendees based on the propensity score, resulting in a balanced group consisting of an equal number of attendees and non-attendees.

The propensity score for each subject ($n = 758$) was calculated by including the four statistically significant independent variables identified in the regression on the entire sample (Domina, 2009; Jackson, 2014).

Propensity scores were calculated by running a binary logistic regression with “Course attendance” as a dependent variable (1 = attendance of PTA, 0 = non-attendance of PTA). The four dominant covariates were entered in order of dominance: APS score, accounting at school, mathematics score and learning self-efficacy. The predicted values of probabilities were saved as an additional variable for all participants of the entire study. Then the file was split into the treatment group and the control group.

The next step was to match treated subjects with untreated subjects using matching without replacement (an untreated subject is matched to only one treated subject). A balanced group was formed ($n = 152$), of which 76 attended PTA and the rest formed the control group.

Results and discussion

Descriptive statistics of the entire and balanced group (PSM)

Table 3 shows the descriptive statistics of the sample ($n = 758$), after outliers with a standard deviation of more or less than three were removed.

The APS is a proxy for academic aptitude and is calculated by the university based on a points system allocated to the student’s symbol (i.e. A or B etc) scored in the Grade 12 year.

There were more women than men in the sample. This is not surprising, since an increase in the participation rates by women in South African higher education has been observed since 2013 [Council on Higher Education (CHE), 2016].

Student motivation, learning self-efficacy and motivation to learn were measured using a questionnaire (Neill, 2008). Constructs were measured on a Likert scale and the scores were converted to a percentage for each.

PSM was done to create a balanced group of participants with similar attributes. The descriptive statistics of the balanced group are shown in Table 4.

Independent variables	Code	Measurement
Academic aptitude	APS	Continuous
Accounting at school	AccSch	Yes = 1; No = 0
Age	Age	Continuous
Course attended	Course	Yes = 1; No = 0
Gender	Gender	Males = 1; Females = 0
Home and language of instruction	SameLang	Same = 1; Different = 0
Learning self-efficacy	LearnSE	Continuous (%)
Mathematics mark in grade 12	MathMark	Continuous (%)
Motivation to Learn	MotivLearn	Continuous (%)
School attended	School	Public = 1; Private = 0
Student motivation	StudMot	Continuous (%)

Table 2.
Independent
variables and coding
used

Regression results

The regression results from the entire and balanced groups are shown in Table 5. No multicollinearity problems existed in either of the analyses. The model fit was significant for the entire group at a one per cent level for PTA (Course) ($\beta = 6,655, p < 0.000$) which is indicative of a positive association with academic performance. Although no comparative study from literature on pre-university accounting bridging courses is available, the findings are consistent with studies in other fields, for example chemistry (Schmid *et al.*, 2012). APS ($\beta = 0.677, p < 0.000$), Accounting at School ($\beta = 14,111, p < 0.000$), performance in Mathematics ($\beta = 0,175, p < 0.000$) and Learning Self-Efficacy ($\beta = 0117, p < 0.000$) were identified as the four dominant factors in terms of statistical significance.

Results from the balanced group indicate that only PTA (Course) and Accounting at School remained statistically significant at the one percent level, confirming the strong association between prior knowledge and academic performance. The relatively small difference between the coefficient for PTA (Course) ($\beta = 8.289$) and Accounting at school ($\beta = 9.193$) is an indication that attending the course was almost as beneficial (in terms of academic performance in the first test) as prior accounting knowledge gained at school.

The positive association between accounting at school mathematics, APS scores and performance in tertiary accounting are consistent with prior literature and confirms findings

Table 3.
Descriptive statistics
for the entire sample

Variables	N	Minimum	Maximum	Mean	Std. Deviation
APS	758	25	42	33.89	3.432
Gender	758	0	1	0.44	0.497
Age	758	17	25	18.66	1.051
SameLang	758	0	1	0.58	0.495
School	758	0	1	0.69	0.464
AccSch	758	0	1	0.56	0.496
MathMark	758	41	98	65.45	9.816
StudMot	758	36	98	76.19	9.849
LearnSE	758	26	100	76.17	11.037
MotivLearn	758	30	93	70.30	8.868
Module test (%)	758	36	99	77.93	12.856
Course	758	0	1	0.11	0.319

Table 4.
Descriptive statistics
for the balanced
sample

Variables	N	Minimum	Maximum	Mean	Std. Deviation
APS	152	26	42	34.61	3.156
Gender	152	0	1	0.40	0.492
Age	152	17	25	18.45	0.968
SameLang	152	0	1	0.70	0.461
School	152	0	1	0.62	0.487
AccSch	152	0	1	0.18	0.389
MathMark	152	42	87	65.91	9.492
StudMot	152	41	98	77.30	9.755
LearnSE	152	49	97	77.16	9.879
MotivLearn	152	43	90	71.37	8.381
Module test (%)	152	43	99	75.23	12.323
Course	152	0	1	0.50	0.502

Variables	Prediction	Entire sample			Balanced group		
		β	Std. Error	t	β	Std. Error	t
(Constant)		12.169	8.783	1.386	12.208	23.365	0.522
Course	+	6.655***	1.209	5.503	8.289***	1.848	4.485
APS	+	0.677***	0.138	4.896	0.675*	0.387	1.744
AccSch	+	14.111***	0.790	17.852	9.193***	2.505	3.670
MathMark	+	0.175***	0.047	3.727	0.212	0.118	1.795
LearnSE	+	0.117***	0.039	2.982	0.085	0.100	0.845
Gender	-	-1.752*	0.771	-2.273	0.154	1.953	0.079
Age	?	0.582*	0.366	1.589	0.343	0.982	0.349
SameLang	+	1.020*	0.771	1.322	-2.346	2.002	-1.172
School	+	0.683	0.802	0.852	2.509	1.892	1.326
StudMot	+	-0.016	0.042	-0.376	0.059	0.111	0.527
MotivLearn	+	0.054	0.050	1.088	0.035	0.134	0.259
N		758			152		
Adjusted R^2		39.3			23.3		

Table 5.
Attendance of PTA
and performance in
Module test 1 – entire
and balanced
samples

Notes: Unstandardised regression coefficient shown; ***significant at a 1% level, **significant at a 5% level, *significant at a 10% level

reported by [Doran et al. \(1991\)](#), [Evans and Farley \(1998\)](#) and [Tepper and Yourstone \(2018\)](#). Self-efficacy (Learn SE) yielded statistical significant results with the highest association with academic performance out of the three motivation constructs. This confirms findings by [Byrne and Flood \(2008\)](#) and [Tepper and Yourstone \(2018\)](#).

Results and treatment effects. OLS analysis was used to calculate the ATE. This treatment effect includes the effect on the “always-takers”, i.e. students who are generally more motivated (see entire group LearnSE’s significance) and should not have done the course (56% of the entire group completed accounting at school). Therefore, results based only on OLS cannot be generalised to the population of students who would be assigned for treatment and received it.

PSM was used to create the balanced group where students were paired with another student with the same prior accounting exposure, marks in mathematics and self-efficacy levels. The interpretation of the results from the balanced group provides a more robust method to compensate for self-selection bias. PSM is used to determine the ATE on the treated and therefore the results can be generalised to the students who received the treatment.

In both analyses the attendance of the course was a statistically significant intervention that had a strong association with performance in the assessment and as such H_1 is accepted:

H1. Bridging courses provide students with the benefit of prior accounting knowledge that is evident in their academic performance.

Conclusion

Bridging courses are presented with success in other disciplines, but it has not received attention in accounting education. This study provided a thick description of a bridging course in introductory accounting which draws on educational strategies whilst providing students with fundamental accounting knowledge.

This study also reports on the association between attendance of the course and academic performance. A positive and significant association was found between attending PTA and performance in the first formal assessment.

This study provides educators with a description of the content covered during the four-day pre-university course which was developed using strategies that will assist students with transitioning from school to university. The content presented is sufficient to establish a positively significant association with academic performance whilst not overburdening students during the four-day intervention. A pre-university course is a feasible option for universities that aim to address academic underpreparedness, whilst creating learning communities within large cohorts of students.

This study was the first to include three constructs of motivation, namely learning self-efficacy, motivation to learn and student motivation. Learning self-efficacy emerged as the most significant component of the three constructs. Educators are encouraged to include strategies that focus foremost on the enhancement of self-efficacy as opposed to other forms of motivation.

Educators should also be cognisant of barriers to participation. It is suggested that bridging courses are presented free of charge to students to encourage participation, even more so in communities with socio-economic inequality. Therefore, barriers to participation need to be considered before inferences can be made based on ATE or ATT. It is prudent to accept that the inferences made based on the results must be limited to those who received the intervention, thus, the average treatment effect on treated (ATT). However, given the association with academic performance, educators might consider awarding additional marks for attending the pre-university course or exemption from other academic activities during the formal academic term in order to motivate participation.

Suggestions for future research include the calculation of the local ATE (LATE). LATE is neither the ATE for the entire population nor the treatment effect of a subpopulation constructed by identifiable variables (Guo and Fraser, 2010). The generalisability of findings needs to be extended to students who ought to receive the intervention but did not (“defiers” and “never-takers”). Thus, to make more robust inferences and to compliment the estimated ATE and ATT, the LATE can be estimated by using Heckman’s models.

Notes

1. Motivation to learn determines a student’s attitude towards learning and willingness to learn and participate (Afzal *et al.*, 2010). It is also the driving force behind a student’s desire to engage in training and to master the content of the course (Noe, 1986).
2. Student motivation encapsulates a broader domain of learning and motivation, as it involves achievement motives, and the need for achievement, power and affiliation (Pintrich, 2003). Student motivation also entails a student’s goals and the perceived importance of the task at hand (Pintrich and De Groot, 1990).

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