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TEACHING FIRST LEVEL TERTIARY ACCOUNTING USING A GRAPHICAL METHOD TO IMPROVE STUDENTS' UNDERSTANDING AND ENGAGEMENT

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Abstract

Introductory accounting is a first level accounting subject in an undergraduate accounting degree. The subject provides students with fundamental knowledge of, and skills in applying, accounting concepts and principles, and prepares students for higher level accounting subjects. Research shows many students struggle to understand these accounting fundamentals, and indicates that contemporary teaching methods, utilising visualisation and graphical representation, could benefit student learning. An innovative method of teaching accounting using graphics proposed by Darlow (2016), yet to be validated, has potential to enhance the understanding of complex accounting principles. The current study uses a quasi-experimental method to compare students taught using a traditional approach to those taught using Darlow's method. The sample consists of undergraduate students enrolled in the introductory accounting subject in two consecutive trimesters; a control group of students taught in Trimester 2 and a quasi-experimental group taught in Trimester 3. Tests of understanding were compared to ascertain differences and a satisfaction survey was deployed. Findings provide implications for teaching both introductory and higher-level accounting subjects, and for designing learning and assessment materials.

Keywords

First Level Accounting, Tertiary Accounting, Graphical Method, Student Understanding, Student Engagement

1. Introduction

Introductory accounting is the first level accounting subject in an undergraduate degree with an accounting major, or a core subject in a non-accounting undergraduate degree. The subject scaffolds student understanding of higher-level accounting subjects (Warren & Young, 2012), and helps students form their perceptions of accounting as a profession (Duchac & Amoruso, 2012). The fundamental topics of the subject cover accounting concepts and principles related to assets, liabilities, owners' equity, revenue and expenses, double-entry recording rules, accounting cycle, and financial statement preparation.

The study of introductory accounting requires student understanding of basic concepts and principles for application and problem solving. Accounting requires that students learn logical and often rule based principles and concepts that are then applied to practical situations in differing ways. Thus, it is extremely important for students to learn the application of a technique and have an in depth understanding of that technique to support the application of the concept or principle at the right time in the correct way. Further, accounting principles tend to be hierarchical in nature, therefore it is essential that students grasp the basics before moving onto more complex concepts (Jaijairam, 2012).

Prior studies provide evidence of students' unsatisfactory performance in introductory accounting and there are several reasons for this. Students have difficulties understanding double-entry book keeping rules and accounting equations in relation to revenue and expenses (Dangi et al., 2017). Also, from the student perspective, accounting involves mathematical functions, number and calculations, thus, is abstract and difficult to understand (Dangi et al., 2017, Phillips & Graeff, 2014). Further, students consider accounting as boring and are less motivated to study accounting (Mastilak, 2012; Toerner, 2012). Thus, low results in introductory accounting subjects are common and result in unfavourable attitudes towards accounting (Toerner, 2012).

Research shows alternative teaching methods could benefit student learning in introductory accounting (e.g. Dangi et al., 2017; De Lange et al., 2003; Mastilak, 2012; Suwardy et al., 2013), especially when they are new to tertiary learning environment (Kitching, 2015). In particular, the use of visualisation and graphical representation aids the understanding of complex concepts (Clarke & Paivio, 1991). Cognitive Load (Sweller & Chandler, 1994;

Paas, Gog & Sweller, 2010) and Multimedia Learning Theory (Mayer, 2001 & 2002) support the beneficial effect of imagery and graphical representation of complex materials.

A new method of teaching introductory accounting using graphics introduced by Darlow (2016; 2018) is proposed for this project. Unlike other methods currently adopted in accounting teaching, this novel method introduces graphical representation of accounting concepts. This innovative way of teaching the subject is proposed to enhance student understanding and ultimately improves student results. The method has not been validated but has great potential given the research base that supports the use of such a method.

This research answers the question:

Does the graphics teaching method improve student learning outcomes in introductory accounting?

a. Does the use of the graphics method improve student understanding of key accounting concepts in the subject?
b. Does the use of the graphics method improve student satisfaction?

The following sections form the remaining parts of this paper. Section 2 reviews literature that has a positive impact on student understanding and performance and justifies the current research topic. Section 3 explains the research method, and Section 4 discusses the findings. Section 5 concludes the paper.

2. Literature Review

The existing literature suggests different ways to enhance student learning and performance in introductory accounting. The major approaches include pre-class planning (Popa el al., 2012), subject redesign (Spiceland et al., 2015), classroom redesign (Lownie and McQuarrie, 2014), and innovative teaching approaches (Stice and Stocks, 2000) such as virtual learning (De Lange et al., 2003), digital story telling (Suwardy et al., 2013), and game-based learning (Dangi et al., 2017; Fouché and Visser, 2008; Mastilak, 2012; Phillips and Graeff, 2014).

Popa el al. (2012) found participatory teaching and learning improves student performance in accounting subjects by thoroughly planning prior to classroom activities that comprise group work, student active engagement, and student-teacher interaction. The right teaching methods result in better learning outcomes and teaching experiences (Dangi et al. 2017, De Lange et al. 2003), and learning environments for students (Phillips & Graeff, 2014).

The findings by Wygal et al. (2014) from a survey of twenty two Australian accounting educators reaffirms the importance of effective teaching approaches to student results.

Spiceland et al. (2015) found evidence on how redesigning an introductory financial accounting subject could improve the enrolment rates and student performance in an accounting program. The subject redesign emphasised core competencies, retaining of deep knowledge acquired from prior accounting subjects, as well as student engagement and active learning using advanced technologies.

Lownie and McQuarrie (2014) reported on the benefits from redesigning an introductory accounting class to resemble team sessions in soccer training. These sections included warm-up, balance, agility and coordination, skill and technique, simplified small game, game, and cooldown. The study resulted in enhanced student performance and experience in both business and non-business programs.

De Lange et al. (2003) evaluated the pedagogical approach of Virtual Learning Environments (VLE) in introductory accounting at a large Australian university. The purpose was to examine whether VLE benefitted student learning outcomes. WebCT was selected as a VLE teaching tool, and students were surveyed on their opinions on WebCT applications. The findings showed that students were satisfied when using WebCT for lecture notes, bulletin board, on-line assessment and other tools such as chat and video summaries.

Suwardy et al. (2013) used a digital story telling tool to engage students in learning activities. Digital story telling differs from written or verbal story telling in that the former allows student visual and auditory engagement. This project simulated a twelve-part story of three business graduates who used financial information in making decisions concerning their start-up business. Results indicated such a digital story enhanced student understanding of accounting concepts and processes, and how accounting information contributed to management decision making. Similarly, Phillips and Graeff (2014) created a learning simulator that motivated students when they completed a hands-on exercise in purchasing and selling merchandise, which enabled them to gain solid understanding of relevant accounting principles.

Dangi et al. (2017) explored the Accounting Royale Balls Game (AccRoBa Game Approach) as a game-based learning tool that helped students conceptualise and apply the accounting equation to record journal entries for transactions related to revenue and expenses. The game was used as an in-class activity and involved 250 students from a non-accounting major. Students were required to identify and explain journal entries for revenue and expense transactions provided to them on flash cards. The game was found to offer multiple benefits to

students. First, students were able to classify more effectively five elements of financial statements, namely assets, liabilities, equity, revenue and expenses. Second, the game facilitated peer learning as students worked in teams during the game.

Fouché and Visser (2008) conducted an extensive literature review on the development and integration of board games in teaching introductory accounting. The findings evidenced board games as a creative and effective learning and teaching methodology. This is because board games stimulated student interest in learning introductory accounting, building student knowledge and skills, and broadening student view of the accountant's role. From the teachers' perspective, board games explained the link between theory and practice. Thus, board games were suggested for teaching both accounting and non-accounting subjects. In general, Tham and Tham (2015) found that game-based teaching engages and motivates students better than the traditional mode of teaching.

Mastilak (2012) applied two teaching tools that aligned millennial students' learning characteristics to the traditional lecture-based approach in introductory accounting. The board game Monopoly® was used to illustrate demand for accounting information, and the LEGO® blocks were used to explain cost concepts. Collectively, the tools enabled students to engage in social learning and to identify relevant accounting information and basic cost concepts.

Other studies suggested alternative strategies to better teach and learn higher level accounting subjects. Abeysekera (2011; 2015) conducted two research projects exploring accounting teaching pedagogies that were preferred by students and consequentially improved student learning outcomes. Abeysekera (2011) examined student preferences for three instructional methods in accounting teaching in a Sri Lankan university, namely the traditional, interactive, and case study–based group methods. The traditional and interactive instructional methods differ according to the level of student engagement within the learning activities. While the traditional method emphasises the teacher's role, the interactive method encourages students to learn proactively by asking questions and participating in discussions. The case study-based group method divided students into groups and used case studies in teaching and learning. While the traditional method was associated with passive learning and least preferred by students, the interactive and group case-based methods facilitated active learning. Abeysekera (2011 p.9) defined passive learning as 'memorizing, note taking, describing, and explaining', and active learning as 'relating, applying, and theorizing'. Students most preferred the interactive method, and least preferred the traditional method.

In another study, Abeysekera (2015) provided further evidence of student preferences on the traditional, interactive and group case-based instructional methods. The accounting

subjects in this study embedded algorithmic content. The findings showed the highest level of student preference for the interactive method in subjects with high algorithmic content, and the lowest level of student preference for traditional methods across all subjects. The case study-based group method was preferred in the subjects with low algorithmic content. Among all subjects, financial accounting received the highest score for all six criteria of algorithmic rigor.

A range of teaching tools were explored, aiming to increase student motivation and to improve their understanding of subject materials in preparation for classes. Examples include guided reading questions (Brown et al., 2016), digital game-based learning (DGBL) (Carenys and Moya, 2016), and a mathematical matrix approach (Vysotskaya, Kolvakh and Stoner, 2016).

Guided reading questions aim to motivate students to read and engage in effective preparation for flipped classroom learning in an intermediate accounting class within accounting and non-accounting major programs (Brown et al., 2016). Once prepared thoroughly, students are expected to participate in class learning activities. This tool shows multiple benefits including student motivation, reading quality, and content understanding prior to their class attendance. The impact was more positive and significant for non-accounting major students.

Similarly, digital game-based learning can be applied to different aspects of accounting teaching (Carenys & Moya, 2016). These include topic preparation prior to teaching, DGBL deployment, learning outcomes and evaluation of learning outcomes, and areas for further considerations by DGBL researchers.

Finally, the matrix mathematics approach was used to teach a second-year accounting subject (Vysotskaya et al. 2016). According to this approach, accounting was a science at university and thus teaching legitimately incorporated mathematical foundations.

The above studies empirically tested accounting teaching pedagogies and tools to enhance student understanding and performance in introductory accounting. However, none of these studies explored teaching methods that utilise the visualisation and graphical representation of accounting concepts and processes.

This project explores the graphics-based teaching method developed by Darlow (2016 & 2018) to teach students enrolled in the first level accounting subject in the Bachelor of Commerce program at an Australian university. The Darlow's method will be explained in detail in the next Section 3 Research Method.

3. Research Method

This section highlights the main differences between the graphics and traditional methods in accounting teaching, then explains the research design, sample, and instruments.

3.1 The Graphics Method

Darlow (2016 & 2018) uses balance charts to represent the basic accounting concepts and elements of financial statements being assets, liabilities, equity, income and expenses. A PowerPoint presentation was created by the lecturer based on this underlying principle of the graphics method, and used as the teaching materials for the experimental group. This section compares the traditional and graphics method in terms of how each method explains the key concepts, transactions and financial statements. The Appendix provides a sample set of the PowerPoint slides that feature these differences between two methods in more detail.

The balance sheet equation, or accounting equation, is a fundamental concept in introductory accounting, which underpins the double-entry rules and transactions. While the traditional method states the equation and describes how three variables are related, the graphics method uses coloured bars to illustrate this concept for both types of Balance sheet. The sample screenshots are provided below for each method; Figure 1 shows the traditional method and figure 2 shows the graphics method.

Balance Sheet – Traditional

- Also known as the Statement of Financial Position
- Shows assets, liabilities, and equity
- At a specific point in time
- Represents the Accounting Equation
    - Account format: Assets = Liabilities + Equity
    - Narrative format: Assets – Liabilities = Equity

Figure 1: *Example of the Traditional Method*

Graphics Method

The coloured bars demonstrate three variables in the accounting equation, with total assets being equal to the sum of liabilities and equity:

- yellow bar – assets: The amount that an entity owns and is owned.
- green bar – liabilities: The amount that an entity owes.
- blue bar – equity: The amount that an entity is worth.

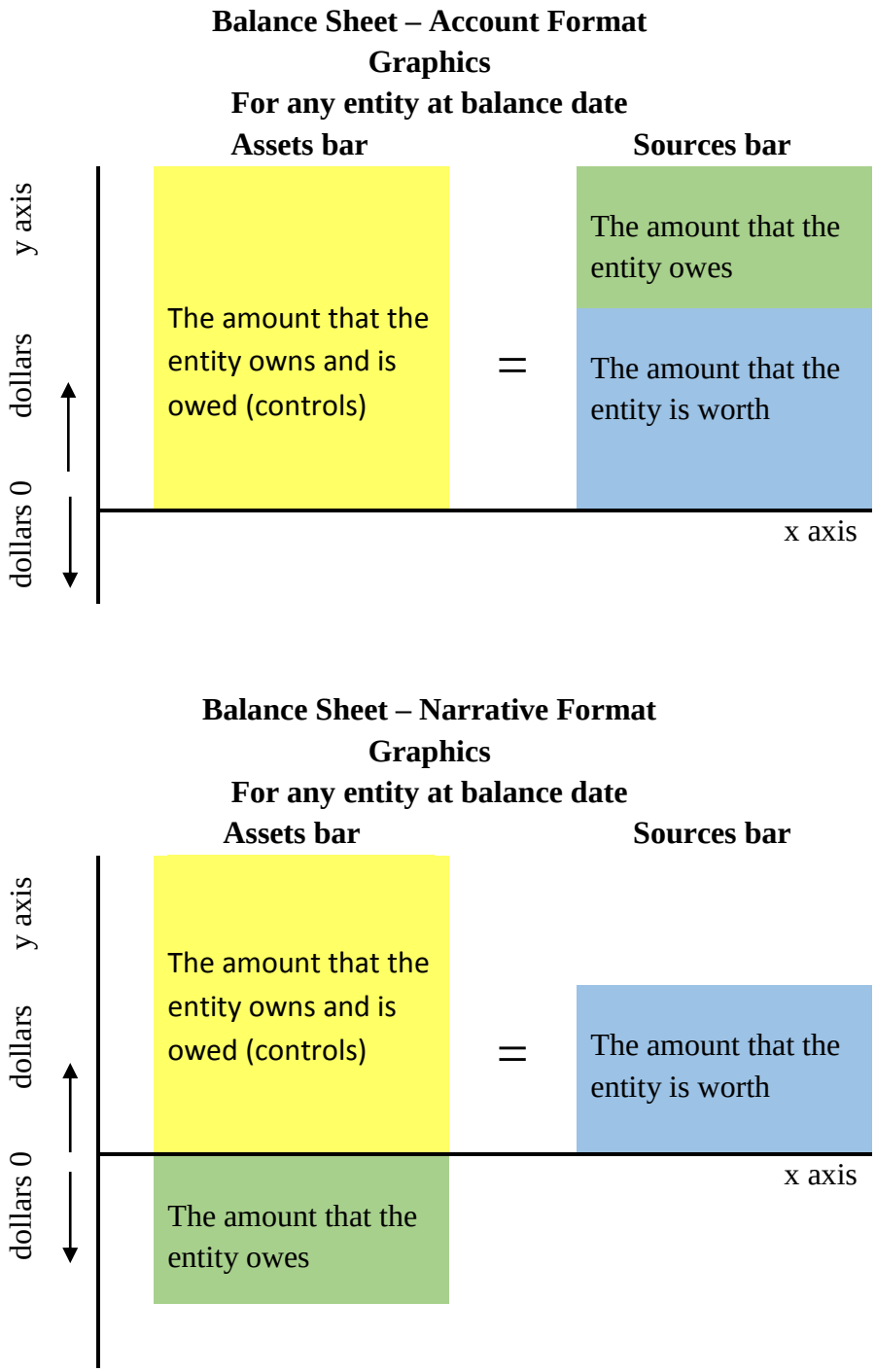

Figure 2: *Example of the Graphics Method*

An economic transaction may affect different elements in the accounting equation but ultimately, the equation remains in balance. A sample transaction is illustrated below in Figure 3 showing the difference between the traditional and graphics method.

Example 1 - Traditional						
Darren Jones deposits $35 000 in a business bank account.						
Assets			**=**	**Liabilities**	**+**	**Equity**
Cash at Bank						D. Jones, Capital
$35 000			=			$35 000

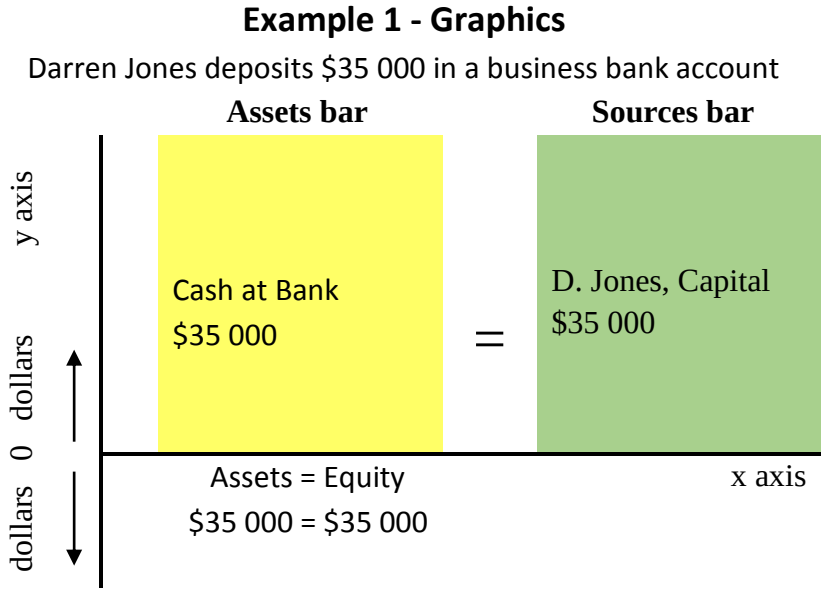

Figure 3: *Comparison between the traditional method and graphics method*

3.2 Research Design and Sample

This study used a quasi-experimental method and was conducted in Trimester 2 and Trimester 3 in 2018. The research sample comprised 62 students enrolled in the first level accounting subject as part of a Bachelor of Commerce course at an Australian University. This included 39 students enrolled in Trimester 2 and 23 students enrolled in Trimester 3.

The enrolled students were divided into a control group and an experimental group. The control group consisted of students enrolled in both trimesters, while the experimental group had 4 students enrolled into one of the classes in Trimester 3. The experimental group was taught using the graphics method.

In Trimester 2, all 39 students in the control group were invited to complete the online satisfaction survey. However, only 8 students completed the survey.

In Trimester 3, the same survey was administered to 23 students in both control and experimental groups. Out of 19 students in the control group, 5 students completed the questionnaire. All 4 students in the experimental group completed the questionnaire.

In total, 17 out of 62 students completed the survey. This resulted in a response rate for the survey of 27 percent.

3.3 Tests of Understanding

In Trimester 3, all students in both control and experimental groups completed a test of understanding during the trimester, i.e. the mid-term test, and an examination at the end of the course. The mid-term test and final exam were blind marked by an independent academic without knowledge of the group to which students were assigned. The students' marks from each group were compared to assess differences in student performance between groups. Further, differences were differentiated by topic area to discern any impact of teaching method by topic area.

Fifteen topics were assessed in the test and exam:

1) Accounting process
2) Accounting cycle
3) Double entry accounting principles
4) Adjusting and reversing entries
5) Closing entries
6) Trial balance
7) Statement of changes in equity
8) Income statement
9) Balance sheets
10) Receivables and non-current assets
11) Cash management and control
12) Retailing and inventory
13) Financial analysis and interpretation
14) Accounting systems
15) Receivables and non-current assets

Topics 1-3 were covered in the test, while all topics were covered in the exam.

3.4 Satisfaction Survey

The satisfaction survey was built using the online survey tool 'Qualtrics'. The survey consisted of 43 questions under 9 categories:

1) *Learner Characteristics*: 2 questions asking about enrolment status and native language

2) *Self- directedness*: 6 questions such as *In my studies, I set goals and have a high degree of initiative*.
3) *Student Behaviours and Perceptions*: 4 questions asking about student learning behaviours with questions such as *How frequently do you ask the lecturer questions?*
4) *Engagement*: 5 questions about student engagement with the learning content such as *The class held my attention*.
5) *Student Learning Outcomes*: 14 questions about student perceived understanding of different topic areas such as *What level of understanding do you have for Balance Sheets?*
6) Performance: 2 questions about student perceived performance in the subject
7) *Learning*: 5 questions about student perceived learning experience such as *The subject made it easy to connect ideas together*
8) *Satisfaction*: 3 questions about student satisfaction with the subject
9) *Success*: *What strategies did you use to help yourself succeed in the subject?* and Learning Strategies: *What strategies would you recommend to another student taking this subject to enable success?*

All Likert responses were built around a 5-point scale and respondents were required to answer all questions before moving on.

3.4 Analysis

Differences between the control group and the experimental group were analysed using an Independent Samples T-Test. T-tests were carried out between groups for individual questions and sub-questions from the test and final exam, with different questions and sub-questions representing different accounting principles. Thus, this enabled statistically significant differences between groups to be identified for student understanding for each accounting topic.

Levene's test for equal variances was also examined and if variances were unequal the adjusted significance level was used. A similar analysis was carried out for each question on the survey to determine differences between groups for each satisfaction item. Although sample sizes were small and unequal the Independent T-test is a robust parametric test that can withstand small samples (de Winter, 2013). However, statistical power is low therefore type 2 errors were more likely to occur, thus increasing the likelihood of non-detection of statistically significant occurrences.

4. Findings and Discussion

4.1 Graphics Method and Student Test and Exam Results

There was a significant difference in the scores for the experimental (M=2.25, SD=0.50) and the control (M=0.86, SD=0.93) conditions; t (8.6) =4.17, p=0.003 for test results for the topic of balance sheets. The experimental group outperformed the control group on topics that require student holistic understanding of how the accounting equation variables and elements of financial statements are related. In the topic on Balance sheets the experimental group's results were significantly higher than the test results of the control group. For this topic, it is essential that students understand the interconnection among five elements of assets, liabilities, equity, incomes, and expenses to understand and prepare a Balance Sheet.

The experimental group also appeared to outperform the control group for the topic of Income Statements, however, this difference was not statistically significant (M=3.5; 4.3 respectively). Accordingly, the graphics method would likely solve the issue that students found it difficult to understand the double-entry book keeping rules and accounting equation in relation to revenue and expenses (Dangi et al. 2017).

The experimental group also answered better (but not statistically significant) than the control group in the questions related to:

- Retailing and inventory
- Accounting systems
- Receivables and non-current assets

Conversely, the control group's performance was significantly higher than the experimental group in the questions related to Statement of Changes in Equity. There were significant differences in the scores for the experimental (M=1.81, SD=1.72) and the control (M=3.91, SD=0.87) conditions; t (20) =3.66, p=0.002 for test results for the topic of Statement of Changes in Equity. Further investigation would be required to explain this finding but might allude to the benefits for teaching some of the simpler content via the traditional method.

4.2 Graphics Method and Student Satisfaction Survey

There was a significant difference in the scores for the experimental (M=4.75, SD=0.50) and the control (M=3.77, SD=1.24) conditions; t (13.2)=2.31,p =0.037 for whether a student was self-disciplined (In my studies, I am self-disciplined and find it easy to set aside reading and homework time). The experimental group indicated that they were more self-disciplined than the control group. This may explain why the experimental group discussed readings with other students in class more than the control group, which would likely result in

better overall results. The experimental group's responses are consistent with the findings by Popa el al. (2012), that participatory teaching and learning based on group work and student active engagement in their learning process contributed to improved student understanding in accounting subjects.

There was a significant difference in the scores for the experimental (M=5.0, SD=0.00) and the control (M=4.42, SD=0.79) conditions; t (11)=2.55, p=0.027 for whether a student found the classes enriching (The class was an enriching experience). When learning from the graphics method, the experimental group found the class more enriching than the control group. Further, there was a significant difference in the scores for the experimental (M=4.25, SD=0.50) and the control (M=2.58, SD=1.17) conditions; t (12.5)=3.98, p=0.002 for whether a student found the learning material academically challenging (The learning material was academically challenging). These findings suggest that although the students in the experimental group found the material challenging it proved to be stimulating and enriched their experience, thus altering unfavourable attitudes towards more favourable attitudes for accounting (Toerner, 2012). In addition, these results support the findings of De Lange et al. (2003) that new teaching methods stimulate student learning in introductory accounting.

There was a significant difference in the scores for the experimental (M=5.0, SD=0.00) and the control (M=4.08, SD=1.24) conditions; t (11)=2.56, p=0.026 for whether the subject allowed them to better understand concepts (The subject allowed me to better understand concepts). Thus, the experimental group thought that the subject allowed them to better understand concepts compared to the control group. Accordingly, the graphics method could change student view that accounting is abstract and difficult to understand due to mathematical functions, number and calculations (Dangi et al. 2017, Phillips & Graeff, 2014), facilitating better understanding. This view seems to originate from the nature of accounting principles being hierarchical, thus it is important that students grasp the basics before moving onto more complex concepts (Jaijairam, 2012). The experimental group's opinion on their deeper understanding is also aligned with several prior studies. One is the findings by Clarke & Paivio (1991) on visualisation and graphical representation, suggesting they can aid student understanding of complex concepts. Other findings are associated with research on Cognitive Load and the role of visualisation in load (Sweller & Chandler, 1994; Paas, Gog & Sweller, 2010), and with Multimedia Learning theory (Mayer, 2001 & 2002) supporting the benefits of using imagery and graphical representation to teach complex materials.

The findings suggest Darlow's (2016 & 2018) method could be used to teach a range of topics in introductory accounting. The key topics that showed improvements were

accounting equation and double-entry accounting principles, individual transactions, and financial statements. These are the fundamental blocks in introductory accounting and are required as pre-requisite knowledge for higher level accounting subjects. Further, there is an option to apply the graphics method to reinforce these topics in teaching later subjects. In particular, the evidence indicates the graphics method is strong in explaining how five elements of financial statements are interrelated. As this relationship continues to form the cornerstone of more advanced accounting subjects, there is an option to use graphical representations when these elements are revisited.

5. Conclusion

This study serves as a pilot project in using the graphics method by Darlow (2016; 2018) to teach introductory accounting to undergraduate students with the aim of exploring how graphical representations impact student understanding and performance. This method has not been tested in prior research. The findings provide evidence of enhanced student understanding of key accounting concepts and principles, as well as improved student results in selected topics.

The study contributes to the existing literature that explored a range of innovative teaching methods for better student learning outcomes. Some practical implications are drawn in relation to teaching introductory and higher-level accounting subjects.

Nonetheless, the study is subject to limitations. One is the restricted opportunity to generalise the findings to other institutions since this study was conducted with students enrolled in the first level accounting subject at a single university. Further, the sample size of both experimental and control groups was small.

Given that this was an initial pilot study more research is warranted to explore the efficacy of the Graphics method more thoroughly. It is important that that the graphics method is explored using larger samples of students. The extent to which the graphics method enhances student learning in each topic of introductory accounting is required to establish the strengths of the method. Further, the effectiveness of the graphics method for teaching first level accounting students enrolled in a postgraduate accounting program would also be useful to ascertain.

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Appendix

Sample PPT slides show the traditional and graphics methods

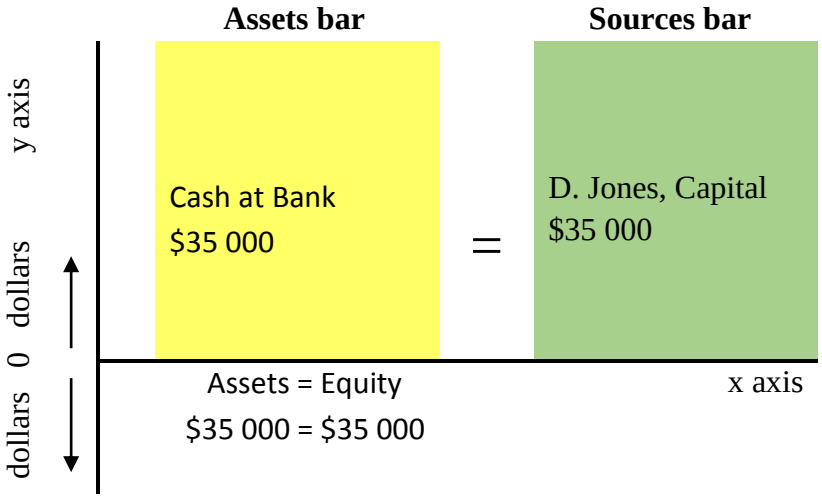
Double Entry Accounting

- Every transaction affects at least two components of the accounting equation
- This gives rise to the term Double-Entry Accounting
- After each transaction is recorded, the accounting equation remains balanced.

Example 1 - Traditional						
Darren Jones deposits $35 000 in a business bank account.						
Assets			**=**	**Liabilities**	**+**	**Equity**
Cash at Bank						D. Jones, Capital
$35 000			=			$35 000

Example 1 - Graphics

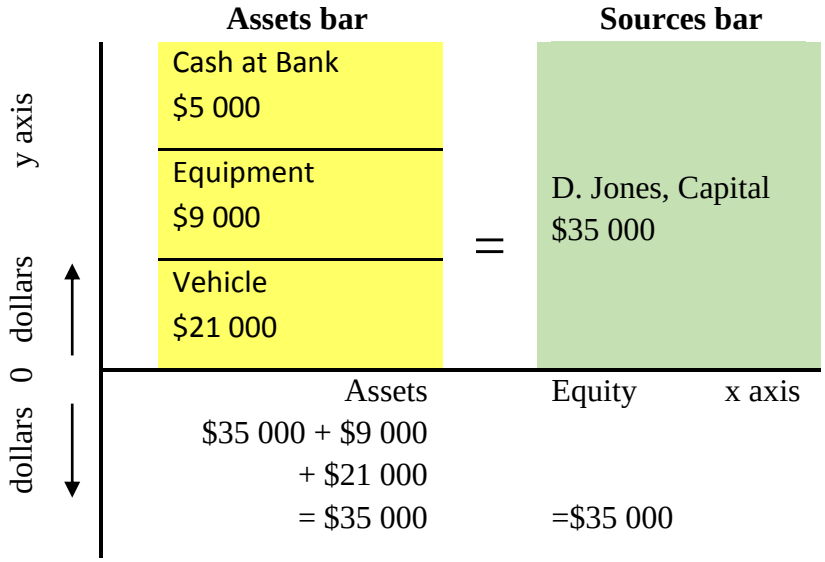
Darren Jones deposits $35 000 in a business bank account



Example 2 - Traditional						
Darren purchases some lawn moving and gardening equipment for $9 000 and a vehicle for $21 000.						
Assets			**=**	**Liabilities**	**+**	**Equity**
Cash at Bank	Equipment	Vehicle				D. Jones, Capital
$35 000						$35 000
-30 000	+ 9 000	+ 21 000				
5 000	+ 9 000	+ 21 000	=			35 000
($35 000)						($35 000)

Example 2 - Graphics

Darren purchases some lawn moving and gardening equipment for $9 000 and a vehicle for $21 000.



Example 3 - Traditional							
Darren purchases fuel supplies for $2 500 on credit.							
Assets				**=**	**Liabilities**	**+**	**Equity**
Cash at Bank	Equipment	Vehicle	Fuel Supplies		Accounts Payable		D. Jones, Capital
$35 000							$35 000
-30 000	+ 9 000	+ 21 000					
			+ 2 500		+ 2 500		
5 000	+ 9 000	+ 21 000	+ 2 500	=	2 500		35 000
($37 500)					($37 500)		

Example 3 - Graphics

Darren purchases some lawn moving and gardening equipment for $9 000 and a vehicle for $21 000.