EDU008 A Reflection on Visual Representation of the Accounting Equation as part of the Teaching and Learning Mix for an Introductory Financial Accounting Class

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Abstract

The accounting education system is facing a multitude of challenges including questions regarding its effectiveness and reliability and these changes increase the pressure on accounting educators to find the most effectives techniques not only for developing the additional skill sets and competencies expected on accounting graduates, but to also develop the foundational skills and knowledge. Much accounting research has been dedicated to considering how to improve the learning outcome of students, specifically considering learning styles, and their match with teaching pedagogies. This paper specifically addresses one of the many techniques available to the accounting educator to assist students in understanding fundamental concepts in financial accounting; namely using a visual representation of the accounting equation. The paper reflects on the 5 year formalized longitudinal survey, of students learning and perceptions using visual representations of the accounting equation. The study found that the majority of students did perceive the visual modeling as helpful in understanding both foundational concepts as well as more complex applications. The author concludes that such a model could be a useful addition to the mix of teaching tools available to accounting educators.

1. Introduction and context

The accounting education system is facing a multitude of challenges including questions regarding its effectiveness and reliability (Fouche 2013, Carnegie & Napier, 2010, Buckhaults & Fisher 2011), especially in the era after the financial crash of 2008. This is further emphasized by the increasing expectations of the business sector for accounting professionals to fulfill broader leadership and managerial roles in a time of rapid technological change (Fouche 2013, Davidson, Slotnick & Waldman 2000), and changes the future of accounting education internationally and in South Africa (Dempsey & Stegmann 2001). All these changes increase the pressure on accounting educators to find the most effectives techniques not only for developing the additional skill sets and competencies expected of accounting graduates, but to also develop the foundational skills and knowledge. Much accounting research has been dedicated to considering how to improve the learning outcome of students, specifically considering learning styles, and the match of teaching pedagogies with such learning styles (Visser, McChlery and Vreken 2006, Hark and Shah 2007, Brown 2002, Claxton and Murrell, 1987; Coffield, Mosely, Hall & Ecclestone 2004). This paper specifically addresses one of many techniques available to the accounting educator to assist students in understanding fundamental concepts in financial accounting, namely using visual representations of the accounting equation. This paper will reflect on a 5 year formalized longitudinal data collection of students' perceptions of the use of visual representations of the accounting equation. The value of this paper in terms of its contribution to the field of accounting education, is that it is the first[1] to explore the use of this specific system of visual representation. If such a system is found to be helpful by learners, then it represents one additional tool that accounting educators could adopt within the mix of their teaching methodologies.

2. Background and relevant research

2.1. Teaching and Learning styles:

2.1.1. Match of teaching and learning styles

Learning styles are the preferred approaches to learning of a subject, while teaching styles are the preferred pedagogical approaches of lecturers. Visser, McChlery and Vreken (2006) suggest the lecturers need to adopt those teaching styles that best enable students with different learning styles to learn most effectively. Various studies have indicated that learning styles have a significant impact on student's academic success (Allinson & Hayes, 1988), and that when lecturers are aware of their students learning styles this can help in the selection of the course strategies (Sangster, 1996) and improve the learning outcomes (Butler 1998). However there is still some debate between whether matching of learning and teaching styles improve student's outcomes or whether mismatching has a more beneficial impact (Felder & Silverman 1988). Wilson & Scalise (2006) note that the congruence or "goodness of fit" between learning outcomes, instruction approach and assessment are key to the success of the learners. Biggs (1999) used the term constructive alignment to refer to this degree of symmetry. However for the purpose of this paper the potential benefits of matching (Ford & Chen 2001) will be explored. Visser, McChlery and Vreken (2006) have indicated that there is a further need for research into how teaching styles can be integrated into accounting education, and this paper addresses just one small aspect of this field of research.

Hark and Shah (2007) propose that few doctoral programs provide comprehensive coverage of adult pedagogy and the philosophy of education and instead they suggest that faculty in higher education either adopt the ways they prefer to learn or the approaches that they perceived as effective when they were students. This is despite the fact that learning styles and learning style models (Claxton and Murrell, 1987; Gregorc, 1979, 1985; Felder & Silverman, 1988; Dunn & Dunn, 1989; Flemming, 2001) have emerged as a significant pedagogical issues. It has been shown that (Claxton and Murrell, 1987; Coffield, Mosely, Hall & Ecclestone 2004) learners learn in different ways. Thus Hark and Shah (2007) suggest that if faculty just assume that students prefer the same learning styles

[1] An extensive literature review could not find papers reviewing such a system. This does not preclude the existence of such systems, in fact the author suggests they might be widely used, but the successes and limitations of such systems, needs to be fully documented, for those in accounting education to be able to consider the merits of such systems for inclusion in their own teaching toolkits.

that they are comfortable with, there could be significant proportions of their students that will not connect with their teaching as effectively as could be possible.

Thus it is suggested they faculty should not assume their teaching styles are broad enough, and Hark and Shah (2007) believe that faculty have a responsibility to expand their repertoire to reach a broader range of students.

There are been a multitude of academic studies that have challenged the traditional approaches to accounting education (Mathews, 1990; Tinker & Koutsoumandi, 1997), and Flood (2007) suggests that the focus has moved away from trying to get students to master massive amounts of technical knowledge, to rather understand the principles behind such knowledge. The focus has thus become on ability to use knowledge as well as flexibility and adaptability in their future careers (Accounting Education Change Commission (AECC) 1990). Such research also has focused on understanding students learning process to improve the outcomes (Lucas, 1996; Beattie, Collins, & Mc Innes, 1997). A discussion of learning styles would not be complete without considering Kolb's (1984) pioneering work on the learning cycle, deep-learning (Ramsdem 1992; Lucas 2000) or that teaching styles supports such deep learning (Biggs 1999; Gibbs 1992) .

Significant research has been done considering for example established indices and questionnaires (such as Kolb's Learning styles Index (1976, 1985) and Mumford's Learning Styles Questionnaire (1992)), based on the established validity of these instruments. However alternative researchers have questioned the validity of these particular instruments. This paper does not seek to not replicate this work, which would add little to knowledge in this field, but will rather consider Meta Programs.

Intrinsically linked to the study of learning style is the idea of Meta programs, which originated out of the work for neuro Linguistic Programming (NLP see later VARK) (Brown, 2005). The Meta programs explain peoples cognitive process, that is the way they think, process inputs and learning (Higgens, Wall, Falzon, Hall, Leat, Baumfield, Clark, Edwards, Jones, Lofthouse, Moseley, Miller & Murtagh 2005). Brown (2002) found that accounting students had the same dominant processes that accounting faculty did. These Meta programs were found to either positively or negatively correlate with performance (Brown & Gaff, 2004). Brown (2004) also found that these Meta programs affected student's perceptions of the quality of the instruction they received and the relationship with their professors. Brown (2002) concluded that matching of Meta programs, would improve communication between lecturers and students. This paper will consider in detail one such Meta program, namely visualization.

2.1.2. *Other Prominent Learning Styles Theories*

When referring to papers on learning styles and accounting education, there are several prominent theories that are most often referenced. These include:

- The Kolb Experiential Learning Theory (Kolb, 1984) postulates that knowledge is gained through processes that are experienced, and which different learners prefer, including experiencing, observation, conceptualization and experimentation. Different learning groups, such as traditional versus nontraditional will prefer different learning styles and (Kolb, 1984; Brobkaw & Merz, 2000) matching learning styles with preferences not only improved their learning experience but also their performance. It is significant to note that Visser, McChlery and Vreken (2006) used the learning styles inventory as developed by Kolb (1984). They found that the majority of students preferred a sensing style on one scale as opposed to intuition, while a significant proportion of lecturers preferred a visual style and students did not. This is significant for this study, even though a different learning model is used, their data would question the usefulness of visualization as a learning modality.
- The Gregorc Style Delineator (GSD) (Gregorc and Ward 1977, Gregorc 1979, 1985, Butler 1986) suggests that people have natural dispositions to learn along four bi-polar (opposite) mind qualities. One of these, namely Concrete- sequential (CS) including methods such as worksheets, charts and flowcharts which are techniques commonly used in accounting education today.
- The Felder- Silverman Learning / Teaching Style Model (Felder & Silverman, 1988) suggests that people have preferences for five bipolar continua that reflect the way they take in and process information, one of which is Visual – Verbal.
- The Dunn and Dunn Learning Style Model, which is measured by the Productivity Environmental Preference Survey (PEPS) (Dunn & Dunn 1989).
- The Revised Approaches to Studying Inventory (RASI) (Entwistle & Tait, 1995; Duff, 2004) looks at three approaches to studying (Hawk and Shah, 2007), including deep, surface and strategic learning.

2.1.3. *VARK and NLP*

The VARK model which was developed by Fleming (2001) considers four primary modes of thinking namely:

- Visual (V)
- Aural (A)
- Read / Write (R)
- Kinesthetic (K)

This model was developed from a previous model based on neuro-linguistic programming (NLP) (Eicher, 1987), and the pioneering work of Bandler and Grinder

(1975, 1979, 1982). The earlier work and true NLP does not include Read / Write as it focuses on ways on thinking, whereas VARK includes reading / Writing as this is a learning style. The basic premise of this work is that people have a primary mode of thinking, but can learn to function in other modes as well. Flemming (2001) notes that most people (41%) function in a single mode, 29% have two primary modes, 9% have three and 21% function in all four. The VARK questionnaire is available commercially (Flemming, 2001), and has been tested for reliability and validity.

People, who think (and learn) primarily in a visual mode, create pictures in their minds and can relate best to diagrams, charts, special arrangements and maps. Aural learners like discussions, lectures, stories, and often tape material to aid in their learning. Read / Write learners like books, essays, handouts, and manuals. Kinesthetic people like actually doing things like experiments, field work, making things, and having guest speakers.

Blander and Grinder (1975)note that certain disciplines and corresponding occupations lend themselves to certain learning styles. For example engineering disciplines which require charts, flow diagrams and 2D or 3D models is a very visual discipline, and is best suited to and attracts people whose primary mode of thinking is visualization. The question arises what primary modes of thinking is best suited to the disciplines of accounting and related disciplines such as financial management and auditing. The author suggests that again visual modes of thinking would favor understanding relationships between numbers, and the flow of numbers in systems. There is little hands on work, and little discussion needed. However much teaching happens in the form of lecturers, which is auditory in nature. A key component of many accounting courses and programs is practice in the form of homework and tutorials which represents reading and writing, and might be argued to be kinesthetic[2]. Thus it is suggested that the primary mode of understating accounting is visual, however the learning process is primary auditory with reading / writing as a supplement, and thus this could lead to a disconnect and frustration on the part of the learners.

This paper examines and attempt in an introductory financial accounting class to use primarily a visual mode of representation of key concepts in terms of the accounting equation[3], with auditory explanations, and supporting exercises and homework as read / write / doing. As much as the accounting framework might provide a framework for understanding recognition, measurement, and presentation and well as the tradeoff between quantitative and qualitative characteristics of data: the accounting equation also provides a useful framework for understanding components of financial accounting specifically including measurement and recording. This understanding

[2] the author suggest not, as nothing concrete that can be physically touched is ever made in tutorials

[3] It must be noted that for simplicity purposes the author used + & - signs interchangeably with Dr & Cr, the reasoning for this is discussed later in the paper.

- Promotes understanding of basic accounting procedures
- Helps address concepts often experienced as difficult by learners
- Provides an easy visual representation of the data, which is well suited to a significant proportion of learners

3. Aim and Objectives

3.1.***Aim***:

To suggest that in accounting education, using a visual representation of the accounting equation, can be useful for promoting understanding of technical concepts for accounting learners. The paper aims to demonstrate that the use of a visual representation of the accounting equation, using simple pluses and minuses, can be perceived to be beneficial by learners in aiding their understanding of core concepts as well as more complex aspects of accounting.

3.2.Objectives:

To achieve the above aim, the objectives of this paper will be:

a) Firstly to illustrate how such visual system could work, then
b) Determine if accounting learners perceive the use of such a system to be helpful in facilitating their understanding of basic as well as some more advanced accounting concepts

4. Methodology:

The analysis will be achieved by both qualitative as well as quantitative methodologies

4.1. Aim (a) "to illustrate a visual representation of the accounting equation"

An extensive literature review was conducted to find any descriptions or discussions of a visual representation of the accounting equation, however no data relevant to the basic modeling of the accounting equation as considered in this paper was found. Thus a description[4] was developed by the author. The literature review did reveal prior research on why Debits and Credits are used as opposed to a more simplistic plus and minus representation, and this is discussed in the results section.

4.2. Objective (b) "to determine learners perceptions of the use of such a visual system"

4.2.1 Qualitative:

Review of findings of assessment data, including data collected through course evaluations (through open ended questions), as well as the results of focus groups, for themes related to the match of learning and teaching styles . The results of two focus groups run at the conclusion of the five year longitudinal study, as well as

[4] Qualitative deduction

student responses to the open comments section of course evaluations for 10 semesters in the selected accounting class, were reviewed for qualitative data relevant to this study

4.1.1. Quantitative:

A longitudinal study of an introductory financial accounting class over a 5 years period (10 semesters) using a self-completing questionnaire with Likert scaled questions. The results collected by this instrument are analyzed using descriptive statistics[5], as well tested for correlation between responses and students performance. The sample size consisted of 92[6] completed surveys, collected over a 5 year period from an introductory level financial accounting class. The surveys returned represent a 36% return rate, which is considered good for a voluntary return. The sample size is limited at the university at which the data was collected, since classes are capped at 25 students, and at most one section of introductory financial accounting is offered each semester. Limitations of this data and subsequent analysis include:

- Reporting bias (perceptions of usefulness of visual models by learners, not actual usefulness)
- Incomplete or inaccurate returns
- Only one learning modality is considered, while other teaching modalities and teaching and learning styles are not considered
- There is no control group[7]

The data for the questions was analyzed for simple descriptive statistics including modes and means, as the basis for inferring the degree of preference or not, for the technique reviewed. It must be noted that a simple correlation was run between reported preferences and the student's grades in the class. This correlation was not tested for significance, nor power, but was collected for the purpose of determining any possible relationship (not inferring causality) between preference for the visual modality and the student's success in the course. The author suggests that a student who did not find the primary mode of explanation useful, may have struggled with the class, which might be reflected in relatively worse grades than students who prefer visual representations of the accounting concepts. Further research would need to be conducted in a more rigorous manner to deduce any causality for a definitive relationship.

[5] The author used means as opposed to modes (which were still calculated), which are more appropriate in ordinal data, as the discrete differences were in most cases too small to notice using the absolute values of modes

[6] The complete analysis of the data set has yet to be finalized, and the sample size will change by date the release of the final paper, after a final review of the completed questionnaires.

[7] The author did not want to potentially provide any inferior learning experience to any one class, but omitting visual teaching techniques

5. Results and Analysis:

5.1. The visual system

5.1.1. *Background on the use of debits and credits*

Historically we credit Luca Pacioli and his work Summa De Arithmetica Geometria Prortioni et Proportionalita (1494) as the foundation of the current double entry system of accounting. Although Pacioli is credited as being the father of accounting he claims he was merely describing the system of accounting that was in used by merchants in Venice at that time. What is significant is the use of the terms translated as Debtor and Creditor, more commonly denoted now as debit and credit, although Pacioli specifically used the terms ‘per’, that is from and ‘A’, that is to in his journals. Peters and Emery (1978) suggest the terms debit and credit were used and not a plus (+) and minus (-), as the concept of negative numbers was not in popularity at the time by mathematicians. They suggest influences such as Omar Khayyam’s (1045 to 1123) rejection of negative numbers, as well as Descartes (1596-1650) and Pascal’s (1623-1662) rejection of negative numbers reflecting the thinking of the time. They suggest the first mathematician to embrace negative numbers was in fact Thomas Harriot (1560 to 1621), whose work significantly postdated that of Pacioli’s work. Hence they suggest the terminology of the time was wrapped up in the thinking of the time, and how we ended up with the concepts of debits and credit (or more correctly ‘Per” and “A” for increases and decreases of only positive numbers). The author suggests the concept of debit, from Debtor, makes no sense when applied to a fixed assets for example, and in the following section raises the question asked by so many students, “why not just + and –“? Perhaps the origins of the Debit and Credit make sense historically for the late 1400’s, but do they make the same sense today, or is this just a naming convention, that could potentially add to the confusion of students new to accounting? Although this is beyond the scope of this paper to fully consider, in the representation of the accounting equation in the subsequent sections of this paper the author refers primarily to pluses and minuses. However students must be familiar with the concepts of debits and credits as the nomenclature of accounting so this was covered in all classes.

5.1.2. An overview of the visual representation system reviewed

The following representation of the accounting equation is not new or original[8] but is used for reference in this paper as one possible form of a visual modality for teaching and learning. Further, the paper will review two aspects[9] of financial

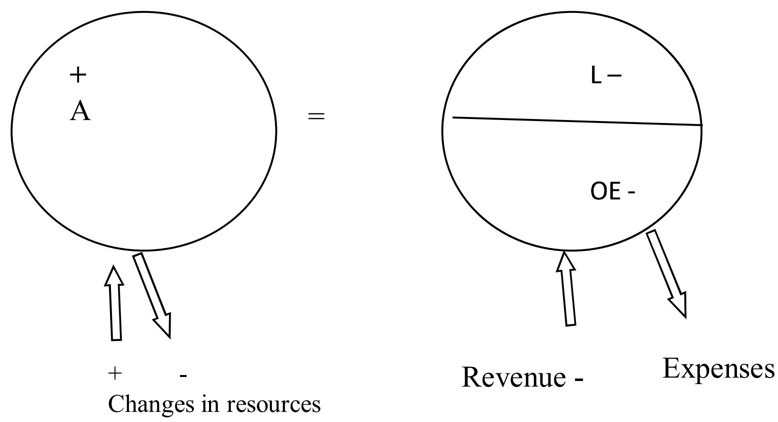
[8] The author could find no similar systems through a literature review, however it is suggested that similar systems are probably widely used.

[9] The author uses this framework to teach almost everything in financial accounting (including cash flows), and financial management (including capital budgeting, WACC and financing decisions)

accounting that students are comfortable with computing mechanically, but in the author's opinion often struggle to conceptually understand. These are:

- Group accounting i.e. consolidations, and
- Financial analysis i.e. ratios

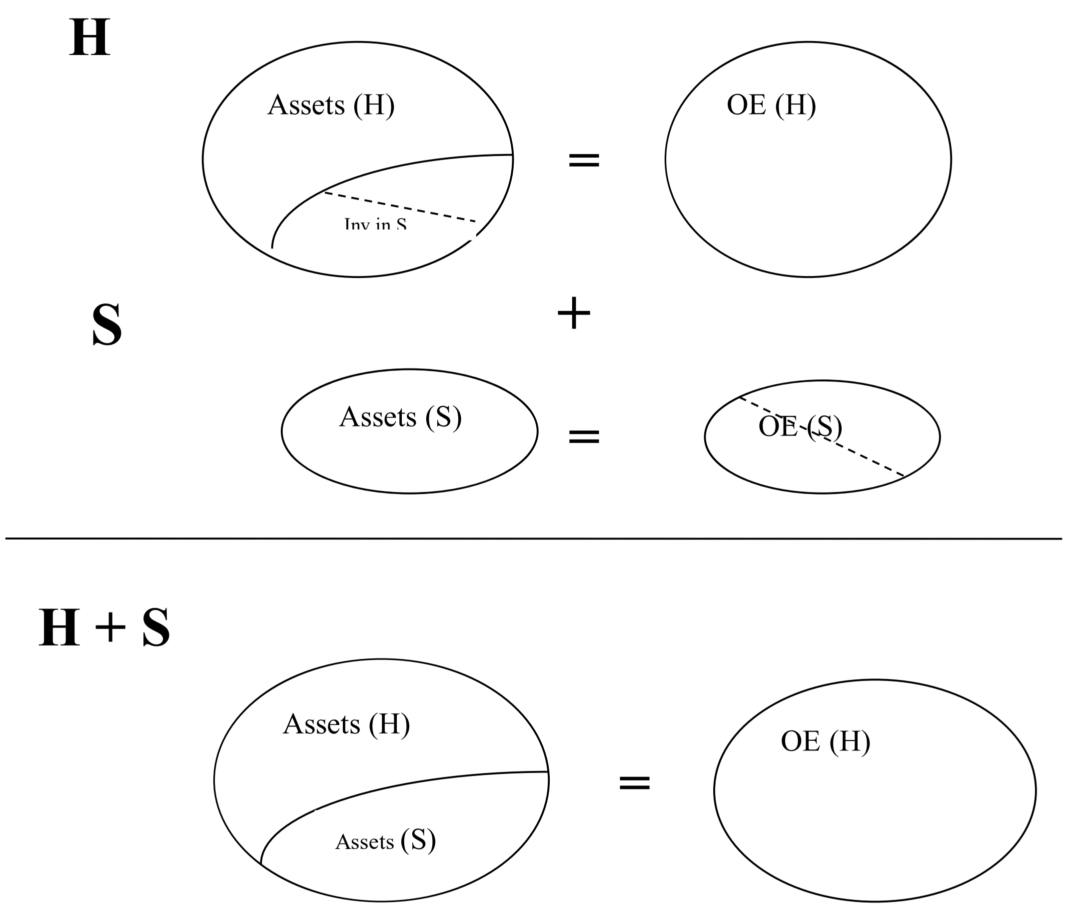
Figure 1: The accounting equation



In its simplest form the accounting equation is shown as positive assets, owners' equity as negative (the entity owes resources to the owners), and liabilities as negative (the entity owes resources to the lenders). While changes in resources are just added and subtracted directly off assets, Revenue (- as it increases the OE) and Expenses (+ as it decreases OE) are kept separate for reporting purposes until the accounting cycle is closed off, when they are combined and added to owner's equity.

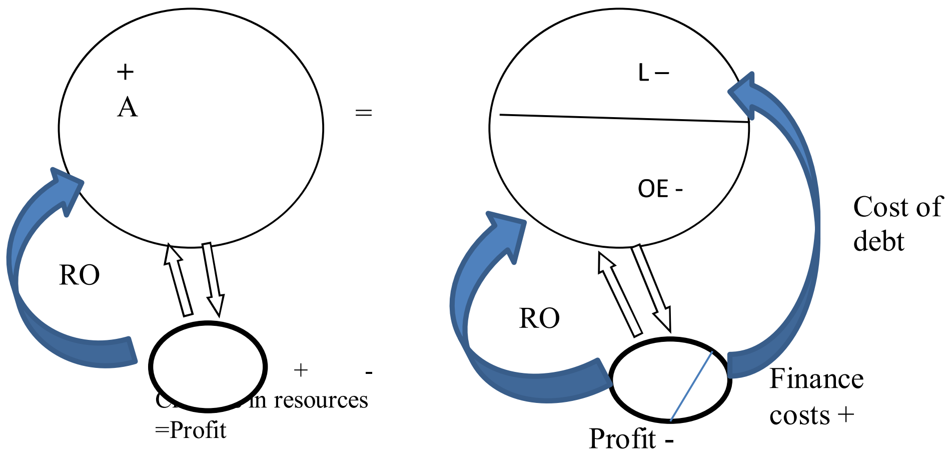
As suggested above, there are two aspects of financial accounting that can be explained visually in terms of the accounting equation as can most aspects of accounting as opposed to just a methodology such as analysis of equity, or formulas, which are considered below.

Figure 2: Group Accounting



In the above diagram, the consolidation process is shown as cancelling out investment in S with the equity of S, to produce the consolidated (combined) result. Note, this can be adapted for goodwill, minority interests, subsequent post acquisition earnings etc.

Figure 3: Financial Analysis



Using such a visual diagram students can see what we are measuring by Return on Assets (ROA) and Return on Equity (ROE) and it is clear why the latter is calculated after deducting finance costs. Such a diagram can be further modified to distinguish between operating versus other assets, as well as different classes of equity. Profit can be shown as the net of revenue and expenses. Liquidity and solvency can also be shown through this diagram.[10]

5.2. Perception of the use of the visual system

5.2.1. Qualitative Analysis

5.2.1.1. Focus Groups

At the conclusion of the 5 year review two focus groups were run using students who had completed the accounting. These groups contained 7 and 6 students respectively, and were facilitated by trained student peer advisors, to avoid any reporting bias that a faculty member would have introduced. The focus groups yielded little data that is relevant to this study, other than most students showing a distinct preference to teaching styles in this course compared to a different required undergraduate course in the same discipline.

5.2.1.2. Course Evaluations: Open ended Student comments

Since these questions were open ended and did not specifically require students to respond to teaching styles and techniques, the bulk of the data received related to:

- Students enjoyment of the class
- The usefulness of the class

[10] As noted several times in this paper such a visual modality is potentially very helpful explaining a multitude of concepts both in financial accounting and financial management, with other visual representations (not necessarily based on the accounting equation) being helpful in managerial accounting.

- The difficulty, workload and speed of the class
- Whether they found the online practice / homework helpful

However students did report conflicting results, namely:

- Some reported finding the diagrams as helpful, while
- Others found the diagrams to be confusing

Clearly these results do not answer the research question of this paper.

5.2.2. Quantitative Analysis

5.2.2.1. The accounting equation

No	Question	Mean	Mode	Correlation
3.1	I found I could understand what the bubble[11] diagrams meant / represented	3.71	4	0.09
3.2	I found the bubble diagrams helpful to understand what the business owned and its interactions and obligations to outside parties (owners, lenders, other businesses)	3.79	4	0.11
3.2	I found the bubble diagrams helpful to differentiate between the assets of the business and the owner's equity (and liabilities)	3.71	4	0.12
3.4	I found the bubble diagrams helpful to distinguish between income / expenses and the related cash flows	3.60	4	0.20
3.5	Overall I found the bubble diagrams helpful to understand the accounting equation	3.57	4	-0.03
3.6	I found the bubble diagrams confusing and don't know what they meant	2.29	2	-0.13
3.7	I found going through examples gave me a better feel than the diagrams did for the accounting equation	4.03	4	-0.01
3.8	I found the bubble diagrams useful to understand the Balance sheet	3.31	4	0.11
3.9	I found the bubble diagrams useful to understand the Income statement	3.38	3	0.18

Overall the modes and means indicate that most of the students did find the bubble diagrams useful in explaining the accounting equation, the components of the financial statements including the income statement and the balance sheet, with positive correlations to their grades. The modes for those students who didn't understand them was only 2 with a negative correlation to their grades which is as expected.

[11] Bubble diagrams were used to describe the visual representation of the accounting equation as shown in section 2.5

Interesting is that although the mode of students who felt that doing examples was more helpful than the diagrams, this did not show a positive correlation to their grades, perhaps suggesting that it does not really help them as much as they thought.

5.2.2.2.Group Accounting

No	Question	Mean	Mode	Correlation[12]
4.1	I found the bubble diagrams helpful to understand the basic consolidation process	3.65	4	0.07
4.2	I found the bubble diagrams helpful to understand the cancelling out of investment in subsidiary with the owner's equity of the subsidiary	3.69	4	0.23
4.2	I found the bubble diagrams helpful to understand the creation of goodwill	3.63	3	0.24
4.4	I found the bubble diagrams helpful to understand the concept of minority interests	3.70	4	0.12
4.5	I found the bubble diagrams helpful to understand post acquisition increases in reserves and the allocation thereof	3.36	3	0.12
4.6	I did not find the diagrams helpful to understand consolidations in general	2.54	2	-0.12
4.7	I found the worksheet (analysis of equity) more helpful than the diagrams	3.92	4	-0.13
4.8	I do not understand consolidations	12.00	2	-0.26

As this class is just an introductory level class, students are just taught the basic worksheet for consolidations. Overall the means and modes indicate the major portion of the students did find the diagrams useful in helping explain the process of consolidation, with positive correlations to their grades. The modes for those students that did not find them useful was 2 (a lesser proportion of the class), with a negative correlation to their grades. It is interesting that although there was a strong response from students indicating they preferred the worksheets to the diagrams this had a negative correlation to their grades, suggesting that this did not really help them understand and apply the knowledge as effectively. Although the modes for those students who claimed to not understand the process was only 2, the answers to this question did have a negative correlation to their grades as expected.

[12] In the first draft of this paper the statistical significance of the correlations was not tested or reported. The initial analysis was computed on excel, however the data is now being run of SPSS version 14, and will be reported in the final paper, and will include the determination of significance and the power of the result.

5.2.2.3.Financial analysis

No	Question	Mean	Mode	Correlation
5.1	I found the visual links between the income statement and balance sheet in the bubble diagrams helpful in understanding what the ratios are telling	3.86	4	0.01
5.2	I found the visual links within the income statement (e.g. for gross profit margin, interest cover) helpful in understanding what the ratios are telling[13]	3.95	4	0.01
5.3	I found the timeline diagram helpful in understanding the cash cycle and working capital management	3.86	4	0.28
5.4	I do not understand ratios	1.92	2	-0.32
5.5	I find it easier to learn ratios by formulae than to try understanding the diagrams	3.62	4	0.08

Although the majority of students found the visual links and diagrams helpful, these responses did not have a very strong correlation with their grades except in the case of the cash cycle, which was not actually using the diagrams of the accounting equation. Not surprisingly students who claimed not to understand this section had a negative correlation with their grades. Students who said they preferred to just learn the formulas did have a positive, but small, correlation to their grades.

6. Discussion

The findings of the qualitative analysis were inconclusive, and did not provide any useful data as to whether the use of visual representations of the accounting equation were helpful to students to their understanding of accounting concepts. However for the understanding of basic transactions to more complicated concepts like consolidations or financial analysis the quantitative data analysis did indicate the students perceptions that the diagrams were helpful in understanding these accounting concepts, with means in the mid to high 3's (on a scale from 1 to 5), and modes of 4. Despite this the students indicated that practice examples were even more helpful (with a mean above 4). Student's positive perceptions showed positive correlations to their grades. Students who indicated that the visual representations were not helpful, showed negative correlations to their grades. Thus for students who perhaps preferred other learning modalities, the use of visual representations had a negative relation to their performance. Thus it is suggested that educators should attempt to use a wide variety of techniques to match all learning styles.

[13] as also represented in more complex bubbles

7. Conclusion and Recommendations

Overall the findings of this paper indicate that the majority of students do find visual representations of the accounting equation helpful in understanding various aspects of accounting, and this is supported by positive correlations to their grades, suggesting that it does really help them. Even where many students did indicate that they found examples or worksheets more useful, the correlation of these responses to their grades was in fact zero or negative, suggesting that even though they may have been more comfortable with these learning techniques they did not necessarily help them understand the work better. Students who found the work generally confusing had a negative correlation with their performance. Thus the author can conclude that either using a visual representation of the accounting equation as a teaching technique is an effective tool for teaching accounting, and / or that the majority of students in the accounting classes, prefer visual processing as a mode of learning.

The author suggests that despite evidence to suggest that a major portion of learners use visual processing, instructors should endeavor to engage the whole class. Hawk and Shah when considering Meta processing suggest (2007):

- The big picture for global learners
- Diagrams, flowcharts and writing on the board for visual,
- Speaking out load for aural
- Step by step for sequential
- Combination of theory and numbers for abstract and concrete learners

This study does however come with many limitations, as students are getting not just visual but, auditory, kinesthetic, and reading/ writing instruction. Further as has been noted in this paper there are several other prominent learning styles theories, and the instructor would have been teaching students sequentially, starting with the global picture of each section and using a combination of theory and practical examples (which most students liked) in the classes. Hence positive correlations with grades could have been caused by any of these factors which are not possible to isolate.

Future research could isolate performance not just in the course as a whole, but in each of the sections, for definitive correlation[14]. Further various instruments could be used (VARK etc.) to determine the students learning preferences, then correlate these against their responses. Stronger qualitative research techniques as used by Bargate (2012), could also help inform the usefulness of such visual modelling of the accounting equation to promote student learning.

[14] Testing for power, and significance in order to be able to conclude on any correlations found.

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