The benefits of concept mapping in accounting education

Toby York, April 2021

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Introduction and outline of paper

The building block of accounting, double entry bookkeeping, is essentially unchanged from the system that Luca Pacioli described in the late 15th century: all transactions must be recorded using two entries of equal amount, a debit and a credit. It is a deceptively simple system and one that will never be improved, even when the robots take over. At the time of Pacioli, double entry bookkeeping was used in and around the markets of Venice, but today it is a global technology used by all organisations regardless of size or complexity.

There are few areas in education that have such a simple and singular system to teach, and if more than 500 years of past performance are any indication of future developments, once learned can be held by students for the rest of their lives without fear of obsolescence.

Teaching accounting can, therefore, be meaningful and sustainable, and I believe, also thoughtful and pleasurable. We are able to share with our students the joys of intellectual discovery that accounting provides and it is incumbent on us to hone our craft taking great care for how we teach accounting. If successful, we can change forever the way our students think.

A concept map can play a significant part in those efforts as it supports and complements many of the teaching methods suggested by the recent literature on cognitive psychology and pedagogy.

The paper is in three parts. In part one, I identify some common problems with current accounting education practices, drawn mostly from personal and anecdotal experiences. You and your students may already have overcome these, in which case skip this section. In part two, drawing on literature in

cognitive psychology and other disciplines, I offer 8 specific educational benefits of concept mapping in accounting education. In part three, I explain the layout and some of the functions of the concept map that I use, the BaSIS Framework^{TM}.

My postulates are tentative. Although they are based on recent and widely accepted empirical evidence from cognitive psychology, they have not been tested directly in classes of accounting students using this concept map—although this sounds like an exciting area for further research.

With other enthusiastic accounting educators, we have recently created a community–AccountingCafe.org—to discuss and explore these and other ideas germane to accounting education.

Part 1: Some problems with current accounting education practices

There's no time

From time to time we are all susceptible to the illusion that the faster we speak, the more our students will learn. This is reinforced in universities where success is determined by measurements of rapid transfers of knowledge.

Consequently staff do not feel that they have enough time for intellectual work, including being able teach "slowly" (Berg and Seeber, 2016. p. 17). Slowness, in this sense, means being more attentive to the ideas, and not distracted by technical details. It resists a syllabus packed with technical

learning outcomes, which is in any event, instrumental, reductive and misguided.

Slowing down our teaching, especially at the beginning of the learning journey, gives our students the opportunity to absorb, to discuss and elaborate, thereby deepening their understanding.

This is not about expecting less of students—on the contrary—once absorbed as a schema, the concept map enables them to encode complex concepts faster, flexibly and for longer.

The problem with intuitive teaching

Accounting educators have invariably been students for many years and consequently have experienced good and bad teaching. Being able to differentiate good from bad can help, but it doesn't in itself, make you better. I've seen a few great jazz concerts and some terrible ones too, but I know that I can't play any instrument as well as the worst of those performers.

When it comes to teaching, we more readily rely on our personal experiences and intuitions. This creates two problems: (1) it can lead us to pick the wrong learning strategies and (2) once we have adopted that strategy we tend to ignore evidence that refutes our intuitions and seek out evidence that confirms them—*confirmation bias* (Weinstein and Sumeracki, 2019. p 22).

An associated problem with intuitive teaching is that students may be impressed by their lecturer's professional credentials, and so provide them with false affirmation that they are good teachers (Gebreiter, 2021).

Sharing our professional experiences is not the same thing as experiential teaching and learning.

Student expectations

Understandably, in return for tuition fees students are expecting career-enhancing degrees and there is evidence that this is leading to the adoption of more textbook-driven, technical and vocational teaching approaches (Gebreiter, 2021). Furthermore, teaching quality is, in some institutions, being defined by student satisfaction scores (Gebreiter, 2021).

A functional approach to education is misplaced and we should be resisting the pressure to turn our courses into "bootcamps for pliant self-improvers" (Collini, 2016. p. xi).

Firstly, there is ample evidence that employers require critical thinking skills of graduates and are not impressed by their ability to "memorise and regurgitate" (Korn, 2014).

Secondly, in a recent report from the UK's Office for Students (2021), it appears that harder working students are generally more satisfied.

So, it appears that, if we want career-enhancing degrees and high levels of student satisfaction, we must find ways to make students work harder, and foster their intellectual curiosity and scholarship. This is not achieved by introducing ever more technical content, but by cultivating deep thinking and giving them time to deliberate and to reflect, that is, to make their learning meaningful.

A standardised and technical curriculum

Many accounting educators have the pressure of meeting accreditation

requirements in order that their modules qualify for exemptions from professional exams. I have heard academics say that they have no time to introduce anything new into the syllabus for this very reason.

I think it is worth pausing for thought here and to reflect carefully:

1. Is there a danger that we are using the threat of losing exemptions as an excuse to continue using our preferred teaching strategies? See the point about confirmation bias above.
2. Exemptions are secured largely on the basis of demonstrating technical learning outcomes, but these are often at the expense of removing critical thinking or research-led content (Gebreiter, 2021). Are we best serving our students if we do not deliver higher order learning outcomes?
3. Accounting is more than a functional skill, but if we view it only with an instrumental, employability-focussed approach, our students will find it difficult to have new or worthwhile thoughts (Berg and Seeber, 2016).
4. Teaching and learning must be pleasurable. Not just because pleasure experienced by the instructor and the students is the most important predictor of learning outcomes (Berg and Seeber, 2016. p. 34), but feelings of even mild joy and contentment are enough to stave off the effect of negative emotions in teachers (Berg and Seeber, 2016. p. 40).

Conceptual incoherence

I am an advisor to the Accounting Literacy Foundation, a non-profit organisation that promotes accounting literacy. One of the foundation's

projects involves collecting examples of “conceptual incoherence” in any text, report or other media related to accounting.

Conceptual incoherence in this context includes what we believe to be errors, incongruities, conflations, contradictions, or language that is in any plain-speaking sense misleading.

Examples are not limited to newspaper articles and other ‘lay’ sources, but can be found in accounting software guides, accounting textbooks and even the conceptual frameworks of the accounting regulators.

Accounting educators who adopt what they deem to be a reliable resource without carefully considering its shortcomings are unwittingly at risk of exposing students to conceptual incoherence.

Not all of these are “mistakes”. Conceptual incoherence has worked its way into the language of accounting. For example,“prepayment” literally means *before payment* although accountants generally mean the opposite—an expense that has already been paid. There is an additional layer of confusion because on closer analysis, “prepayments” are expenses *charged* before the period to which they relate that may or may not have been *paid* (York, 2021).

There are many, many other examples of these (another paper maybe) but I particularly recommend the submission made by the Accounting Literacy Foundation (2020) in response to FASB’s *Proposed Statement of Financial Accounting Statement No. 8, Chapter 4: Elements of Financial Statements*.

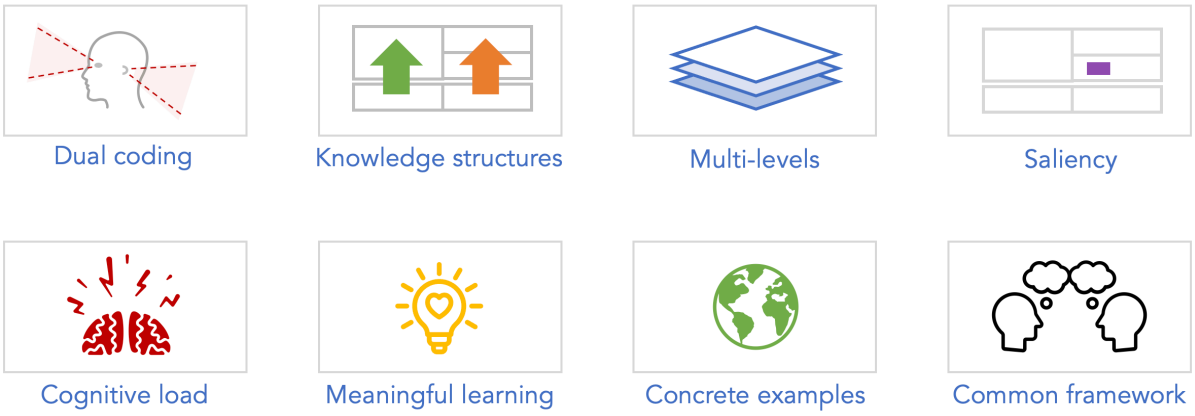
In its proposal, FASB uses the terms equity and net assets interchangeably (Financial Accounting Standard Board, 2020. para. E65). This confuses the quantum of equity (how it is calculated) with the nature of equity which is an obligation to the shareholders (Accounting Literacy Foundation, 2020).

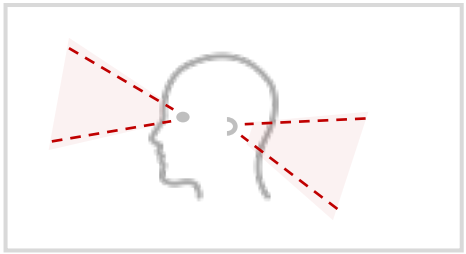
In a similar vein, both FASB’s proposals (Financial Accounting Standard Board, 2020. para. E65) and the IASB Conceptual Framework (International Accounting Standard Board, 2018. para. 4.63) define equity as a “residual interest”. Again, the Accounting Literacy Foundation (2020) points out that a

"plain-English understanding of the term 'interest' implies that the interest is a right, and suggests it is valuable. Equity cannot be a right, nor can it be valuable. To suggest it can be a right or can be valuable is an error of point of view. Only assets are valuable. Equity is not an asset".

A concept map with carefully considered explanations makes students better able to challenge existing orthodoxies and solve new problems.

Part 2: The benefits associated with concept mapping in accounting education





Dual coding

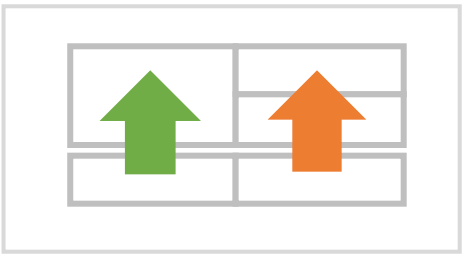
Dual coding, hypothesised by Allan Paivio in the 1960s, suggests that visual and verbal information are processed differently and separately in the

brain. Providing students with the opportunity to learn verbally and visually therefore increases their learning.

Pictures are often remembered better than words and later on the student has two ways of remembering the information (Weinstein and Sumeracki, 2016. p. 112).

This is not the same thing as “learning styles”. Dual coding indicates that all students, regardless of their preferences, will learn more meaningfully when taught with a combination of visual and verbal materials. By contrast, adapting teaching to learning styles does not lead to improved learning (Brown, Roediger and McDaniel, 2014. Chapter 6).

A concept map provides a clear visual representation of the accounting framework but to be effective as a learning tool, it must be used alongside verbal or written explanations.



Organising knowledge structures

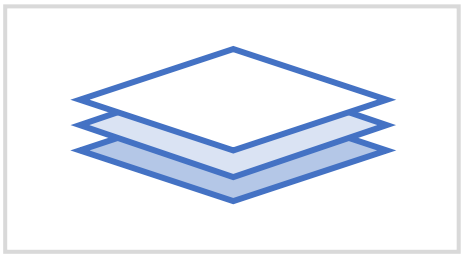
Schema theories describe how knowledge is packaged into units, *schemata*, that contain knowledge and embedded information about how knowledge is to be used (Rumelhart, 1980). There is an underlying assumption that all knowledge is a collection of personal views of reality based on experience and prior knowledge. All learning requires new information to be processed

within our existing schemata.

Reif (2010, quoted in Miller, 2018, p. 67) describes educators paying more attention to the *content* of knowledge than to its *organisation* [my emphasis]. So, the difficult task of organising acquired knowledge is left largely to the student with the result that many students' acquired knowledge often remains poorly organised. Reif suggests that "instructional efforts need to pay as much attention to the organisation of acquired knowledge as to its content". (Reif (2010), quoted in Miller, 2018, p. 44).

A concept map sets out explicitly the accounting schema that we want our students to construct. When this is constructed at the start of their learning journeys, it is thereafter easier for them to understand and contextualise additional associated knowledge.

In a general sense, a concept map provides the knowledge structures within which existing and new knowledge can be organised. In Part 3: The BaSIS Framework, I provide some specific examples of how this is achieved.



Multi-levels of knowledge and moving easily between them

All learning requires an understanding of the whole and of individual parts and details. Learning the details makes the whole more meaningful and

details are made more meaningful by understanding how they relate to the whole (Miller, 2018, p. 49).

A concept map make these multi-levels of knowledge explicit, and it enables students to move between levels fast because they know how the details relate to the whole. It enables them to see the forest and the trees.

A simple example: “Dr Cash / Cr Sales” requires understanding at a transactional level (cash has increased and sales have increased) and at the accounting framework level, assets have increased and income has increased (and therefore equity has increased).

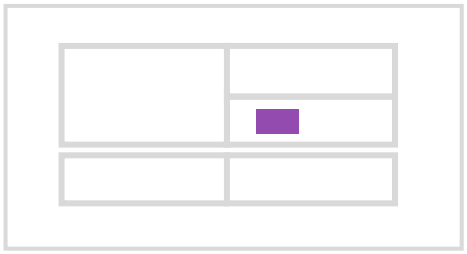
Decreasing extraneous cognitive load

Cognitive load theory (first proposed by Sweller, 1988) holds that the limitations of working memory make it difficult to learn when cognitive demands are excessive. Cognitive loads come from (1) extraneous material, (2) how complex the task is, and (3) the effort to connect new information to what is already known.

Extraneous material is the aspect of cognitive load that is under more control of the educator than the other two.

A concept map reduces unnecessary cognitive load so that working memory resources are free to engage in higher order thinking, rather than

dealing with issues extraneous to learning.



Increasing saliency

Increased saliency theory states that attention, a limited capacity resource, is given to those things in our mind that are highlighted. Generally, people who single out salient concepts from less important information and are able to embed this within a mental structure are more successful learners (Brown, Roediger and McDaniel, 2014. p. 133).

One specific way that educators are able to increase attention (another way of reducing extraneous cognitive load) is by increasing the saliency of learning materials.

A concept map enables specific aspects and ideas to be highlighted with ease if students are already familiar with the overriding structures.

For example, the IFRS Conceptual Framework (International Accounting Standards Board, 2018. para 4.68-9) includes these rather tortuous definitions of income and expenses:

"Income is increases in assets, or decreases in liabilities, that result in increases in equity, other than those relating to contributions from holders of equity claims".

"Expenses are decreases in assets, or increases in liabilities, that result in

decreases in equity, other than those relating to distributions to holders of equity claims."

These statements are self-evident and trivial to understand for students when the definitions are explained alongside an effective concept map.

Meaningful learning

According to the educational psychologist David Ausubel (1968), the single most important factor influencing learning is what the learner already knows. A concept map accommodates this and supports Ausubel's idea of "meaningful learning", that is, when the student comprehends the relationship of what is being learned to other knowledge.

Students who are able to extract key ideas from new material and organise them into a mental model and connect that model to prior knowledge show an advantage in learning complex mastery. (Brown, Roediger and McDaniel, 2014. p. 6).

Once a concept map is constructed as a schema it shows students:

- The context of what they already know.
- How new information fits with what they already know.
- How new bits of information fit together.

Concrete examples

Providing real-world or concrete examples improves learning, although the underlying rule or general principle must be made explicit or students may remember the detail of the example but not the abstract concept (Brown, Roediger and McDaniel, 2014. p. 155–8).

A concept map makes clear the connection between specific examples and generalities and, once it is clearly constructed in a student's mind, she is better able to check the accuracy of her own generated examples and elaborations.

A common framework

A concept map understood clearly within a community of learners provides a solid reference point throughout the learning journey. It provides "pointability" for teachers and students alike.

When a teacher knows that the concept map is clearly constructed in a student's mind, explanations can be given faster and with a high degree of

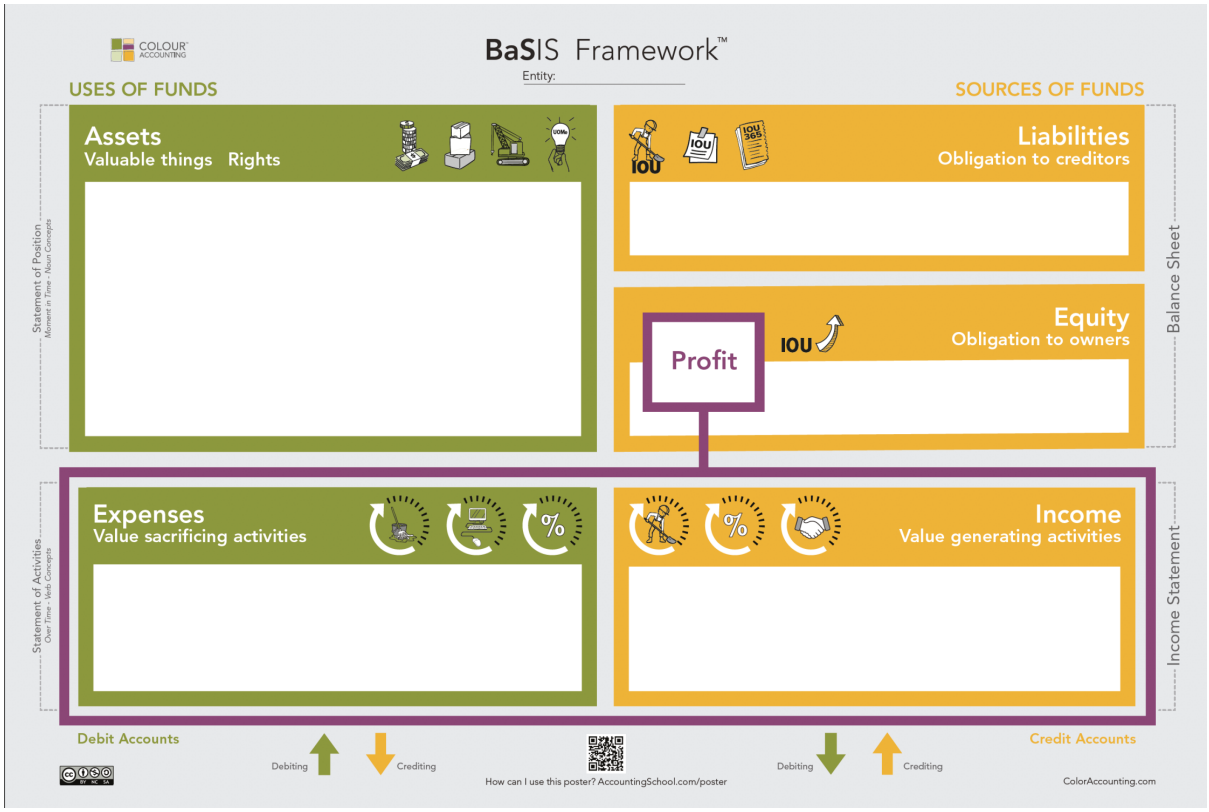
confidence.

For example, many of my conversations with students involve scraps of paper with a black outline of the BaSIS framework without labels. We each know exactly what the other means when pointing to this, annotating it with arrows (increasing or decreasing values), or writing in amounts as debits and credits. To the uninitiated it looks like some kind of coded game, but to us, it's as clear as chess notation is to a grand master.

Part 3: The BaSIS Framework

Traditional concept maps consist of circles or boxes ("nodes") each of which contains a concept and are connected by linking phrases (Novak & Cañas, 2006). The BaSIS Framework is somewhat different, but has the same effect in that it represents and organises knowledge graphically.

There may be other visual representations that are used in accounting education, and I would be interested to see them, but in this paper I use the term concept map to mean the BaSIS Framework^{TM}.



The BaSIS Framework™ (Wealthvox, 2020)

I have been teaching undergraduates and postgraduates on accounting, finance and general business programmes for 17 years and started using this concept map three years ago. It has served me well. In fact, although I qualified as a chartered accountant in 1989, I've done what I require of all my students: to construct the BaSIS Framework as the schema for accounting within their own minds. It has helped me hone my scholarship, clarified much of my thinking and I have made intellectual discoveries using it.

How it works

The BaSIS Framework is a schematic of the accounting framework, providing a spatial map of the financial statement elements: assets, liabilities, equity, income and expenses, as well as making clear the relationships between them.

Using a combination of storytelling and multiple concrete examples, students acquire a clear understanding of the nature of each financial statement element alongside the BaSIS Framework.

The colour green is applied to debit accounts (within assets and expenses) and all debiting effects. The colour orange is applied to credit accounts (within liabilities, equity and income) and all crediting effects.

The use of colours before introducing the terms debit and credit, among other things, makes it clear that there are *debit and credit sides* of the framework and, independently of that concept, each transaction has *debiting and crediting effects*.

Some of the foundational concepts that are difficult for students to learn but are made easier with the use of a concept map include:

- the value of assets is equivalent to the combined value of liabilities and equity, and this equivalence is immutable: every transaction maintains the overarching duality of assets on one side, and liabilities and equity on the other;
- income and expenses form part of equity; income increases equity and expenses decrease equity;
- an increase in equity must result in either an increase in assets or a decrease in liabilities; a decrease in equity must result in either a decrease in assets or an increase in liabilities;
- liabilities, equity and income are the three sources of funds (which for no good reason, we call “credits”); and, assets and expenses are the two uses of funds (which for no good reason, we label “debits”).

The concept map allows students to learn by doing. Students perform the act of debiting to increase assets or expenses, or to decrease liabilities, equity or income. They perform the act of crediting to increase liabilities, equity or income, or to decrease assets or expenses.

The specific cognitive processes that lead to deeper, flexible and more durable learning are discussed in Part 3.

Once they have constructed the BaSIS Framework, or a similar concept map, as a schema, accounting concepts are more easily retrieved and students can use it as a tool for further learning, reflecting, elaborating, and problem-solving.

There is a “pop-up book” version of the BaSIS Framework which allows students to physically post green and orange tickets into buckets. I use this during induction for accounting undergraduates and business management postgraduates which makes for a very pleasurable introduction to accounting for instructors and students alike.

I have developed drag and drop versions of the BaSIS Framework to support learning through low stakes quizzing. You can see examples of these on the Accounting Cafe website (York, 2021).

The concept map is not just a way of introducing accounting to students. It can be (and I recommend that it is) embedded throughout the curriculum. Any new, advanced or complex topic can be explained and tested using the BaSIS Framework.

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Conclusions and further thoughts

Embedding a concept map in an accounting course is not a quick task, and to some extent, it is a continuous effort. It does, however, instil a discipline to reflect carefully about language, structures and organisational frameworks of learning materials.

It seems likely that online education in one form or another is here to stay, so I suggest the imperative to create a clear and shared mental model of the accounting framework is a more important imperative than ever.

Do not let the complexity or size of the task put you off — it is easy to get started and to find out for yourself how this might affect your teaching and the learning of your students. It's also a hugely enjoyable and refreshing approach to reconsidering your own accounting schemata.

There are materials and suggestions on the Accounting Cafe website, where you are welcome to join the debate in our community of enthusiastic accounting educators.

If you have comments or suggestions about this paper, I would very much like to hear from you by email or through the website.

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Toby York FCA

Middlesex University

accountingcafe.org | t.york@mdx.ac.uk

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