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Depreciation: A Threshold Concept in Accounting Education

By

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## Abstract

This dissertation sets out to discover what makes depreciation such a troublesome concept for accounting students. Depreciation has been identified as a threshold concept (Land, et al., 2005; Meyer & Land, 2005) because of its troublesome nature. It requires students to view business activity in an unfamiliar way by matching costs to the revenue they generate. Its integrative nature connects depreciation to other key accounting concepts such as prudence, accruals and going concern, truly demonstrating accounting's subjectivity which when grasped should prove transformational to students.

The main issue of troublesomeness is that depreciation is a term used in everyday parlance as assets fall in value as an effect of wear and tear, obsolescence, etc. This definition will be referred to as the naïve view. The accounting discipline's definition, or the expert view, is much different as depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life<sup>1</sup>', thereby apportioning the cost of the asset over multiple accounting periods.

In order to examine depreciation in detail, the entire first year cohort of accounting students within a UK university were asked to explain depreciation in a short, written exercise. The data was coded against expert propositions to see if the students' understanding was from a naïve or expert perspective. Perkins' (1999 and 2006) work identifying five types of troublesome knowledge was then used as a framework for analysing the students' work in more detail.

It was found that the vast majority of students understood depreciation from a naïve view. They displayed ritualised knowledge and had memorised depreciation formulas but were generally unable to display conceptual knowledge. Students seem to hold an absolutist view of accounting and do not recognise that there is subjectivity within the discipline.

This dissertation adds to the existing literature by examining a large cohort of accounting majors (not non-specialists) and using Perkins' framework, thus examining depreciation in greater detail than seen to date. This has led to a reflection of how teaching can be improved in this area.

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<sup>1</sup> International Accounting Standard 16 *Property, Plant and Equipment* (IAS 16). International accounting standards are the accounting regulations that are followed by most countries around the world including the UK, but not the USA, which still follows FASB, its own national standards.

## Introduction

Depreciation is a concept that is both central to the discipline of accounting and particularly troublesome for students. Depreciation is challenging conceptually as it requires students to view business activity in an unfamiliar way by asking students to 'match' costs to the revenue they generate, a concept specific to accounting. However, the definition that students will be familiar with is of a fall in value of an asset and the challenge is to get them to extend upon this. By asking students to look at something from a different perspective, if they even recognise the subtle difference, makes depreciation troublesome and result in it being a threshold concept.

Threshold concepts are considered 'central to the mastery' (Cousin, 2006, p. 4) of a subject and tend to be areas where students struggle the most. Previous research carried out within the accounting discipline on threshold concepts focuses largely on asking academics to identify threshold concepts (Magdziarz, 2016) and explaining how students deal with pre-determined threshold concepts including language barriers (Lucas, 2000; Lucas & Mladenovic, 2009; Lucas & Mladenovic, 2007). The researchers often take a phenomenographic approach looking at a small number of accounting and business students.

Depreciation has been identified as a threshold concept in accounting by Meyer and Land (Land, et al., 2005; Meyer & Land, 2005). However, it tends not to be specifically referred to as a threshold concept by accounting researchers. Depreciation tends to be treated as a threshold concept as part of the much wider concept of accruals, whereby transactions are recorded when revenue is generated not when cash is expended.

Depreciation is integrative by requiring an understanding of key accounting concepts such as prudence, the accruals concept and the going concern concept. It also expects students to understand the difference between cash and profit as depreciation is a non-cash, accounting adjustment applied by accountants to financial statements. The accountant has to make many judgements when calculating depreciation, for example the method of depreciation, rate and expected residual values. It brings subjectivity into the accounts and, hence, it is not permitted in the UK for the purposes of taxation calculations. This is problematic for students as until this point they will have viewed accounting as being fact-based and mathematical, 'all numbers and number crunching' (Lucas, 2001, p. 177). When students are expected to view accounting as being dynamic, rather than the stereotypical bean counting, they find this problematic. However, if they pursue accounting in this way they are often surprised to find that they enjoy it and find it interesting.

Depreciation, therefore, contributes to the unveiling of accounting and its possibilities. Some students, particularly those who chose it as a degree believing it to be a branch of mathematics, may be uncomfortable. They often think they are on the wrong degree programme as they struggle to 'get to grips with it' (Lucas, 2001, p. 177) and battle with their preconceptions of accounting. Many international students choose accounting believing it to be mathematical in nature, and so less likely to be problematic for those whose first language is not English (Scott, 2014). These students may be disappointed or feel overwhelmed by the degree's content. For most students there will almost certainly be a paradigm shift.

This dissertation will focus on the troublesome nature of depreciation and look at how students explain it in a written class exercise. The data will be examined using Perkins' 1999 and 2006 work on troublesome knowledge as a theoretical framework to consider what makes depreciation troublesome, after it has been categorised as being understood from

either an expert or naïve perspective. Depreciation is being examined not just because it is considered a threshold concept but because it is a topic in both accounting and economics, both of which are taught to first year accounting students, and this may explain some misunderstandings that arise across the degree programme. It is expected that students will revert to naive views of accounting to fill the gaps in their knowledge.

## Literature Review

### Threshold concepts

Meyer and Land (2003) coined the term ‘threshold concept’ and since then much research has attempted to identify threshold concepts within particular disciplines and their use for informing curriculum development.

Meyer and Land (2003) identified five characteristics, often referred to as the Meyer/Land framework, which a topic must have for it to be considered a threshold concept. These are:

- i. Transformative – ‘we are what we know’ (Cousin, 2006, p. 4) in that knowledge changes the way we view the world;
- ii. Irreversible – has a permanency and is difficult to unlearn;
- iii. Integrative – connections can be made with other topics;
- iv. Bounded – bordering other threshold concepts;
- v. Troublesome – unsettling, counter-intuitive, going against what has previously been learnt.

This paper will focus on ‘troublesome’ as this is perhaps the most important. Adler-Kassner, et al. (2012, p. 2) consider troublesomeness along with liminality (the actual learning journey) to be ‘critical’ in threshold concept characteristics. Chen and Poole (2018, p. 585) also consider the importance of troublesome knowledge and explain that troublesome knowledge “is not simply knowledge that is difficult, but knowledge that drastically alters one’s perception of how that ‘piece of the world’ works”. They give the example that medical trainees are unsettled when they discover that medicine is not ‘an exact science’. Similarly, accounting is not an exact science and students are unsettled by the subjectivity of accounting. This is because students at the beginning of their learning journey will display an absolutist view in that something is either ‘right or wrong’ (Lucas & Tan, 2013, p. 106).

Since Meyer and Land’s original work on threshold concepts, there has been much interest generated, not least because it puts the discipline experts centre stage where they can confidently talk of the difficulties in teaching their subject. This is particularly comforting for academics without a background in educational research (Cousin, 2008) although may be problematic as they may lack ‘awareness of educational research methods’ (Quinlan, et al., 2013, p. 587). Much work has been carried out by academics to identify threshold concepts within their disciplines through discussions with their colleagues and, indeed, Cousin (2009, pp. 205-208) sees this as a sound starting point.

The identification of threshold concepts is considered valuable as it aids curriculum development with a view to supporting students in their learning journey by ascertaining the ‘jewels in the curriculum.’ This prevents a ‘stuffed or congested curriculum in favour of one that focuses on really useful mastery’ (Land, et al., 2006, p. 198). However, it has been acknowledged that curriculum development should not focus solely on threshold concepts as this could be to the detriment of other important areas (Nicola-Richmond, et al., 2018).



## Threshold concept research in accounting education

In a study of fifteen accounting academics in Australian universities, which sought to identify threshold concepts in accounting, Magdziarz (2016) found eighteen themes emerged, none of which all fifteen participants agreed were a threshold concept. Three themes emerged as threshold concepts as they were chosen the most. These were 'double-entry' bookkeeping and 'ways of thinking and practising,' both being chosen by eight participants, and 'accrual accounting' chosen by six. The remaining fifteen themes were each chosen by one to three participants, but were arguably part of other themes and did not warrant being allocated to a separate category. Magdziarz then went on to apply the three most popular themes to the Meyer/Land framework to confirm that they were, in her opinion, threshold concepts. This shows that there is a lack of agreement on what constitutes a threshold concept, perhaps because 'the idea of a threshold concept is in itself a threshold concept' (Atherton, et al., 2008, p. 4) and some academics may still be unfamiliar with it. Therefore, it remains with researchers to decide what constitutes a threshold concept within their discipline.

Identification of an accounting threshold concept by an academic is likely to be dependent on the subject the academic teaches within accounting, for example financial accounting, management accounting, auditing or taxation, and whether it is at an introductory or more advanced level. In addition, early career academics who can remember their own struggles with the subject may be better at empathising with their students, whereas those with many years' experience may have forgotten what they found challenging (Barradell, 2013) as accounting has become second nature to them (Myers, 2016, p. 90). Also, the background of the academics themselves is relevant.

Accounting academics are different to those in many other disciplines in that they are often not career academics, may not hold a PhD, and instead are practitioners with professional qualifications and have been appointed because of their ability to be able to practise accounting rather than research it. An accounting researcher is likely to have a different view of accounting and its importance than an accounting practitioner. Hopper (2013) believes that this split of knowledge and experience within accounting departments has an impact on what is taught. As the teaching is mostly carried out by the non-researchers, they will teach what they know and so the curriculum mimics that of a professional qualification. The value of an accounting degree is questionable, particularly as a university degree is one of many routes open to those wishing to enter the accounting profession.

However, the link between academia and the profession does need to be maintained as 'by excluding the profession... from threshold concept identification, an important perspective is missing' (Barradell, 2013, p. 273). There are accounting rules and regulations that must be followed by practitioners and so included in the curriculum. However, it is challenging when designing an accounting programme to decide how much technical content to include for professional accreditation<sup>2</sup>, and how much time to devote to a more critical approach where accounting becomes an academic subject.

Lucas and Tan (2013) examined students' ability to reflect critically. They interviewed six accounting and finance, and eleven business studies undergraduates in the UK and found that students had a strong desire to get a 'good' degree and they felt the way to do this was by accepting everything they were taught as being the only correct view. An accounting

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<sup>2</sup> Most accounting degrees within the UK will be professionally accredited by the major accounting bodies as this reduces the time and cost for an individual to qualify as an accountant. This makes the degree more attractive to a potential student than a more academic degree.

student told them that they 'see accountancy as being quite a kind of learnt subject...learning the concepts and stuff' (Lucas & Tan, 2013, p. 113). This lack of deep engagement has been seen in other disciplines, and Winslow (2011, p. 128) blames the instructor as 'work with theory is occasional, ritual, and limited to the teachers' explanations' with little desire to go beyond this.

Lucas and Mladenovic (2009) have carried out research where it seems that difficulties in accounting stem from prior knowledge, and terminology which crosses everyday and discipline boundaries. Magdziarz's (2016) also touched upon this, as 'discipline based language' was one of her themes when identifying threshold concepts. Lucas and Mladenovic asked 41 stage one accounting undergraduates at a UK university to discuss depreciation, and a further 57 stage one accounting undergraduates at an Australian university to discuss cash and profit. The SOLO (Structure of Observed Learning Outcomes) taxonomy was used to analyse the students' responses. It was found that considerable misunderstandings were apparent surrounding depreciation, and students struggled to see the relationship between cash and profit which was attributed to "misconceptions" that appear to arise from everyday... understandings of accounting and rote usage or mimicry of accounting terms' (Lucas & Mladenovic, 2009, p. 276). Misconceptions are arising from prior knowledge and create a naïve view of accounting terminology. Students also reproduce snippets of what they have learnt without really understanding the meaning and fail to demonstrate higher level learning that would be expected at university. Lucas and Mladenovic suggested that accounting requires a 'particular way of thinking' (2009, p. 276) which has a 'formal reasoning process that may not be evident in everyday ways of thinking'. Therefore, at this early stage students are unable to think like an accountant but, by drawing accounting academics' attention to this, and by focussing on how concepts are explained, such research should benefit the students.

(Lucas, 2000) conducted a phenomenographic study of ten students studying introductory accounting in the UK. She found that their preconceptions of accounting as being dull and mathematically based seemed to impede their learning. In a later review of this work, Lucas and Mladenovic (2007, p. 243) refer to these preconceptions as 'threshold barriers'. It was found that accounting is viewed as a 'technique to be learnt' (Lucas, 2000, p. 487), with the focus being on passing the module with little engagement with accounting as a subject. Unfortunately, half of the small number surveyed were business studies students who would be expected to view accounting in this way, as it is just one of many different subjects that are required to be passed in a business degree. However, the view was also displayed by some, but not all, of the accounting undergraduates and so it would have been of greater benefit if the researcher had selected more accounting students. If the students' preconception at the start of a degree is that something is going to be dull or difficult, it can be challenging to change this view and encourage engagement (Lucas, 2001, pp. 177-8).

Lucas acknowledges that students hold alternative (outside the discipline) and authorised (within the discipline, evidenced in textbooks) views of accounting. This will be examined in greater detail in this dissertation using the terms naïve and expert views. Lucas also refers to students taking a 'personal view of assets' (2000, p. 497), with depreciation being a decrease in value to a resale value rather than a cost to be allocated to revenue over the asset's life. This in itself is not problematic, but the fact that the students do not recognise this is. In a later review of this work (Lucas & Mladenovic, 2007, p. 242) it was considered that if students did recognise the difference between alternative and authorised views, this in itself could be considered a threshold concept.

## A critique of threshold concept research

Rowbotton (2007) challenges the value of threshold concept research as such concepts are 'not as easy to spot as anyone has previously thought', even if they exist. He is critical of the Meyer/Land framework for being too vague, particularly as knowledge can be valuable without being transformative and what may be transformational for one learner may not be for another. Indeed, having seen Professor Ray Land present on threshold concepts, those of us with an interest in educational research found it enlightening, but it proved less informative for other colleagues. Threshold concept research in accounting has been confined to financial accounting, as with most accounting education research. This is something that needs addressing including why only financial accountants have been inspired to look at this area.

Quinlan, et al. (2013) whilst accepting the existence of threshold concepts and the value of research into them, advise us to move away from simply trying to identify threshold concepts. Their paper on threshold concepts in engineering at three different universities demonstrates various methodologies for such research, as they feel that this has been lacking in the literature to date. They explain how concentrating on methodology can help threshold concept research to mature and be of greater value. A way forward, as they demonstrate, is for subject experts to collaborate with educational researchers.

Nicola-Richmond, et al. (2018) have conducted a review of nineteen peer-reviewed journal articles on threshold concepts. They were critical of the general lack of rigour of the existing literature, including sample sizes often being too small, lack of detail in order to be able to replicate the study, no data on the number of students crossing the threshold and poor tools to measure the crossing. They also noted that studies were often too short, for example one semester, to be able to see students crossing the threshold, particularly when students' misconceptions needed to be addressed. Just like Quinlan, et al. (2013) they see a need for more rigorous research in order to legitimise threshold concept research and believe this is needed in the demonstration of threshold concept acquisition.

Whilst most researchers accept the existence of threshold concepts, more rigour is needed in the approach to such research. In accounting, the literature has largely focussed on threshold concept identification and trying to determine what students find difficult. This paper uses the same participant prompt as Lucas and Mladenovic (2009) to examine depreciation. However, the use of a large accounting-major cohort examined using Perkins' (1999 and 2006) work as a conceptual framework and my own set of expert propositions will allow the troublesome nature of depreciation to be examined in greater detail than seen before. It is hoped that by determining the troublesome nature of depreciation, teaching can be adapted to better support students.

## Conceptual Framework: Perkins

David Perkins' (1999 and 2006) troublesome knowledge framework is explained in this section and then in Study 3 it will be used to analyse the students' work and discover what it is that makes depreciation troublesome.

Perkins has identified five types of troublesome knowledge:

- 1) **Ritual knowledge** is data such as names, dates, facts and figures that can be memorised. Perkins considers ritual knowledge as 'routine and rather meaningless' (1999, p. 8). It can be something which is 'learned with no understanding' (Timofte, 2015, p. 85).

- 2) **Inert knowledge** is that which is rarely used and 'sits in the mind's attic' (Perkins, 1999, p. 8) for example rarely used words. Timofte (2015, p. 85) refers to this as abstract knowledge which is 'learned without context' and so cannot be fully understood.
- 3) **Conceptually difficult knowledge** arises from a combination of 'misimpressions from everyday experiences', 'mistaken expectations' and the 'strangeness and complexity' of discipline-based rules and terminology (Perkins, 1999, p. 9). It may be 'counter-intuitive and ... misunderstood because of common knowledge' (Timofte, 2015, p. 85).
- 4) **Foreign or alien knowledge** contradicts what we hold to be true as the 'perspective is new to the learner' (Timofte, 2015, p. 85).
- 5) **Tacit knowledge** is that what we are barely aware of and do automatically, for example facial recognition, riding a bike or driving a car. It 'is not clearly identified, taught, or learned' (Timofte, 2015, p. 85).

In all five areas of Perkins' framework the connecting point is troublesome language. This is not just an issue found in accounting and is problematic in most disciplines. For example, it has been identified by Timofte in her own discipline of chemistry (2015, p. 85) as 'knowledge with troublesome language uses new language or language that may be misunderstood because (it) has other meaning in daily life'.

Perkins' framework has not previously been used in relation to accounting. It has, however, been used by researchers in other disciplines. For example, it has been used to examine the troublesome nature of opportunity cost, a threshold concept in economics (Shanahan & Meyer, 2006).

## Research Questions

As depreciation has been accepted by Meyer and Land (2005) as a threshold concept in accounting education, this study seeks to investigate this more closely, asking:

- 1) How is depreciation represented in various commonly used textbooks? How does this differ from its representation in economics, which accounting students also study?
- 2) How do first year accounting undergraduates understand depreciation?
- 3) What is the source of depreciation's "troublesomeness"?

Each of these questions will be answered respectively in the following three studies.

## Study 1 - An examination of accounting and economics textbooks

### Method

Nine textbooks in accounting (A1 to A9) and five economics (E1 to E5) textbooks were analysed, identifying their definition of depreciation. All textbooks were published between 2010 and 2018 and are the most commonly used in the UK; where indicated 'R' the texts are highly recommended to our students.

## Analysis of accounting textbooks

Author	Book title, publisher, date	Depreciation definition
A1. Collins, Bill and McKeith, John  <b>R</b>	Financial Accounting and Reporting  McGraw-Hill, 2010 (first edition)	'Depreciation is the systematic allocation of the depreciable amount of an asset over its useful life.'
A2. Davies, Tony and Crawford, Ian	Business Accounting and Finance  Pearson, 2011 (first edition)	'The systematic allocation of the depreciable amount of an asset over its useful life (IAS 16). Depreciation should be allocated so as to charge a fair proportion of the total cost (or valuation) of the asset to each accounting period expected to benefit from its use.'
A3. Elliott, Barry and Elliott, Jamie  <b>R</b>	Financial Accounting and Reporting  Pearson, 2017 (18 <sup>th</sup> edition)	'IAS 16 defines depreciation as the systematic allocation of the depreciable amount of an asset over its life.'
A4. Gowthorpe, Catherine	Business Accounting and Finance  Cengage, 2018 (4th edition)	'A measurement of the amount of non-current asset value that has been used up during the accounting period'.
A5. Stolowy, Herve and Ding, Yuan	Financial Accounting and Reporting: A Global Perspective  Cengage, 2017 (5th edition)	'Systematic allocation of the depreciable amount of an asset over its useful life (IAS 16)'.
A6. Thomas, Andrew and Ward, Anne Marie  <b>R</b>	Introduction to Financial Accounting  McGraw-Hill, 2012 (7 <sup>th</sup> edition)  McGraw-Hill, 2015 (8 <sup>th</sup> edition)	'...the allocation of the cost of a non-current asset over the accounting periods that comprise its useful economic life to the business according to some criterion regarding the amount that is 'used up' or 'consumed' in each of these periods.'  'IAS 16 defines depreciation as 'the systematic allocation of the depreciable amount of an asset over its life'.'
A7. Jones, Michael	Accounting  Wiley, 2013 (3 <sup>rd</sup> edition)	'Depreciation attempts to match a proportion of the original cost of the property, plant and equipment to the accounting period in which

		the property, plant and equipment were used up as an annual expense.'
A8. Law, Jonathan	A Dictionary of Accounting  Oxford University Press, 2016 (5 <sup>th</sup> edition)	'1. A measure of the decrease in value of a tangible fixed asset during an accounting period. This includes the wearing out, using up, obsolescence, or other reduction in the useful economic life of the asset.  2. A fall in the value of a currency with a floating exchange rate relative to other currencies. Depreciation can refer both to day-to-day movements and to long-term realignments in value. For currencies with a fixed exchange rate a devaluation or revaluation of currency is required to change the relative value.'
A9. Melville, Alan	International Financial Reporting. A Practical Guide.  Pearson, 2017 (6 <sup>th</sup> edition)	'IAS 16 defines depreciation as the " <i>systematic allocation of the depreciable amount of an asset over its useful life</i> ". ...the purpose of depreciation is simply to allocate an expense between accounting periods.'
<b>R</b>		

#### Analysis of economics textbooks

Author	Book title, publisher, date	Depreciation definition
E1. Black, John; Hashimzade, Nigar and Myles, Gareth	A Dictionary of Economics  Oxford University Press, 2017 (5 <sup>th</sup> edition)	'Loss of value of capital goods due to wear and tear, ageing, or obsolescence.'
E2. Lipsey, Richard G. and Chrystal, K. Alec	Economics  Oxford University Press 2011 (12 <sup>th</sup> edition)	'Depreciation is an allowance for the decrease in the value of a capital good over time resulting from its use in production and its obsolescence.'
<b>R</b>		
E3. Mulhearn, Chris, and Howard Vane	Economics for Business,  Palgrave Macmillan 2015 (3 <sup>rd</sup> edition)	'...the depreciation of a currency involves the lowering of its value in terms of other currencies when the currency in question is not

		part of some formal exchange rate system...'
E4. Parkin, M., Powell, M. and Matthews, K. R	Economics  Pearson, 2017 (10 <sup>th</sup> edition)	'...the decrease in value of a firm's capital that results from wear and tear and obsolescence.'
E5. Sloman, J., Hinde, K. and Garratt, D.	Economics for Business  Pearson, 2013 (6 <sup>th</sup> edition)	'...the decline in value of capital equipment due to age or to wear and tear.'

### Results of textbook analysis

According to IAS 16, depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life', thereby apportioning the cost of the asset over multiple accounting periods. The accounting textbooks reviewed except for book A8 uses this definition consistently. Book A4 is perhaps a little vague referring to an allocation of the amount 'used up' during the accounting period, whereas book A7 explains that the cost is matched to periods of usage.

Book A8, 'A Dictionary of Accounting', was the only book found not to use the expert view and gave the everyday, naïve view of depreciation as a definition. The dictionary also mentions the depreciation of currencies, which is not taught in accounting as it relates to finance and economics. Although this dictionary was only published in 2016, it uses out-of-date terminology so its value is highly questionable. It would not be recommended to our students although it is carried by the library and in the bookshop on campus. Students often, quite correctly, use dictionaries as a starting point in their studies, so it is of concern that such a source should be incorrect.

All of the economics textbooks, except for book E3 which is discussing the depreciation of currencies, consistently follow what would be the naïve view to accountants. Lipsey and Chrystal, book E2, see depreciation as occurring from an asset's use in production and from obsolescence. Although, in accounting depreciation does relate to production or its revenue producing ability, obsolescence is ignored. There is no dual aspect as suggested by Lipsey and Chrystal.

### Discussion

Depreciation has been found to be a threshold concept by Lucas and Mladenovic (2007) because of differences between accounting terminology or 'authorised views' and everyday terminology. The textbook review supports Lucas and Mladenovic's findings but also shows that further confusion arises because in the teaching of economics, accounting students will be exposed to the the naïve view as an expert view.

The problem with depreciation is that both real-world and accounting definitions are correct, which is what makes it so problematic, compounded by the fact that students will study introductory economics as part of their accounting degree. The definition of depreciation used within economics will reinforce the layperson's definition as it is seen as 'the decline in value of capital equipment due to age or to wear and tear' (Sloman, et al., 2013, p. G:3) or 'the decrease in value of a firm's capital that results from wear and tear and obsolescence' (Parkin, et al., 2017, p. 464). This is further complicated as economists use capital to mean 'all inputs into production that have themselves been produced (e.g. factories, machines and tools)' (Sloman, et al., 2013, p. G:2), whereas accountants refer to capital (or equity) as the injection of cash into a business by its owner(s). When capital is referred to as equity

students get further confused as they have heard their parents' talk of having equity in their home.

If we look at the definition of depreciation in everyday language as taken from [en.oxforddictionaries.com](http://en.oxforddictionaries.com) we see that it is what students would be familiar with, that is, a 'reduction in the value of an asset over time, due in particular to wear and tear'. Therefore, students would be more familiar with the economic reasons for depreciating an asset, whereas accounting sees it as writing off the cost of an asset over time to the revenue which it helps to generate. Furthermore, students struggle with the depreciation of buildings, because accounting sees them as being consumed by the entity. However, students know that in the real-world buildings usually appreciate in value and so the carrying/book value of a building bears little relation to its market value. Melville, book A9, seeks to clarify the situation by adding to the IAS 16 definition:

'The depreciation process makes no attempt to show assets at their current values. Nor does it guarantee that there will be funds available to replace those assets when they come to the end of their useful lives. Depreciation charges reduce profits but have no direct effect on an entity's cash resources and do not ensure that cash is "saved up" to buy replacement assets.'

(Melville, 2017, p. 82)

It is very common for students to believe that depreciation is a 'pot' of money set aside to replace obsolete assets and Melville is clearly seeking to dispel this myth, whilst showing that profits are reduced but cash is unaffected. The accounting value of assets could be considered artificial, because, as Melville states above, these may bear no relation to their market values.

Looking again at Melville's definition, we see another issue that causes problems for students. Depreciation is one of many accounting adjustments that are made to financial statements where there is no movement of cash, which results in an entity's cash balance not being equal to its profits. Students find it very difficult to understand that profits or losses are dependent upon accounting treatment, which will differ from one accountant to another, arguably making profits artificial. Lucas and Mladenovic (2009) found that students struggled to explain why profits do not equal cash, which accountants frequently have to explain to business owners. It can be very challenging to explain to a business owner that despite being profitable their bank account is overdrawn.

The book review shows that accounting students are exposed to various definitions of depreciation during their first year of study. In addition to this, they do 'not come to instruction as blank slates' (Smith III, et al., 1994, p. 116), they bring with them knowledge. Therefore, we are asking students not to abandon what they know but to only use the accounting version of depreciation within the discipline and appreciate that 'there exists different ways of thinking in different contexts' (Lucas & Mladenovic, 2007, p. 242).

Davies (2003, pp. 3-4) has found similar problems within economics as students do not come to the discipline as complete novices. They have experiences of being consumers and employees, and, similarly within accounting, students have some experience of managing their own finances. Davies sees it as the academic's responsibility to develop these basic understandings to a more subject-specific, expert view by building upon this basic view rather than abandoning it completely.



## Study 2 – An examination of students’ understanding of depreciation

### Methodology

#### Participants

Stage one financial accounting students at a teaching and research university ranked in the top 25 in the UK, were asked at the start of their second term to describe depreciation (see Appendix 1). The majority (73%) of the 180<sup>3</sup> students are studying for a single honours degree in Accounting and Finance with a minority studying for a joint honours degree with either Law (8 students), Mathematics (23 students) or Economics (17 students). The vast majority of the students come straight from completing ‘A’ levels or equivalent qualifications. Although 43 (24%) of the students are classed as ‘mature’ nearly all of these would still be in their twenties. 32% of the cohort is female and 68% male, which is different to the accountancy profession that is more evenly gender balanced. 78% of the students are classified as being home students<sup>4</sup> and 22% are international students.

#### Degree programme

The entry tariff for the degree programme is ‘A’ levels of ABB, which is typical for entry to accounting programmes at universities of similar ranking. The programme numbers remain static, perhaps because of its strong professional profile, despite the overall fall in the number of school leavers, and other routes available into accounting careers such as direct entry from school supported by higher degree apprenticeships.

#### Curriculum context

Accounting is a discipline which includes subjects from many others. The first year of the degree under examination is typical of offerings nationwide. It is made up of five modules: economics, management, mathematics and statistics, business law, and financial accounting. Therefore, we are exposing students to the business world where many concepts may conflict. For example, accounting often contradicts what students will have learnt within their legal studies as accounting is more interested in the substance of a transaction, following the concept of ‘substance over form’, rather than the strict legal form, seen most frequently in accounting for leases and groups of companies. We have also seen in the textbook review that accounting and economics share the same vocabulary but with different meanings.

#### Procedure

The task given to the students was described as a revision task and which they would be given feedback on the following week. The question was given on the top of a plain sheet of A4 paper so that students could write their response underneath. They were not asked or required to give their name or any other identifying data. The students were given between five to ten minutes to complete the task at the end of their financial accounting seminar. The task was carried out by two seminar leaders, one of which was the author, in nine seminar groups held over three days during week 3 of the Spring term, which was the week commencing 5<sup>th</sup> February 2018. This was the second term that the students had studied financial accounting. Depreciation was introduced as a topic in the lectures in the week

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<sup>3</sup> This is the number of students enrolled at the start of the academic year. A few will have transferred to another school or left the university by the time the data was collected.

<sup>4</sup> Have the right to remain in the UK without time limit (most European Union nationals but not all categories of British citizens meet this criterion), and have been ordinarily resident in the UK for the three year period before the start of the degree.

commencing 13<sup>th</sup> November 2017, with application of the topic occurring in the seminars after this.

All students attending the seminars participated in the study, which was 121 students (67.2%) out of the full cohort of 180 students. This is a much larger sample than in previous accounting research of this kind.

The scripts were initially analysed in the seminar groups they were collected from, just in case students towards the end of the week were advised of the task by their peers and revised the topic. However, that does not seem to have been an issue, perhaps because the students were advised that the task was for our own purposes to see how they were progressing.

The students appeared to take the task seriously, as they remained silent during the duration, and did not stop work until encouraged to do so by the seminar leader at the end of the session.

It was anticipated that the students would find the task challenging and so by way of feedback, the students were given a handout on depreciation (see Appendix 2) the week after the task. This was to give the discipline's view of depreciation whilst explaining the technicalities, which they are generally more familiar with.

The author initially sorted the results by reading the students' scripts several times before dividing them into categories depending on the students' understanding compared to expert/textbook versions. The responses were then labelled Student 1, Student 2 and so on through to Student 121. The weakest students will generally have the lowest numbers and the strongest will have the highest. After this labelling had taken place, the responses were coded according to the expert propositions below.

#### Expert propositions

The author, following the textbook review in Study 1, created the expert propositions. They were then passed to a professor of accounting who has over thirty years' experience in teaching and researching accounting and is also a qualified CIPFA (Chartered Institute of Public Finance and Accountancy) accountant, who reviewed and agreed the propositions.

#### Proposition:

1. Depreciation is subjective.
2. Depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life' (IAS 16).
3. The asset's cost is matched to the revenue it assists in generating.  
Accruals/matching concept.
4. If an entity is a going concern, it must depreciate its non-current assets. If it is not a going concern, the assets will be held at resale value.  
Going concern concept.
5. Depreciation is not a cash expenditure.
6. Depreciation is an accounting estimate of the consumption of an asset.
7. The expensed cost is charged (debited) to the statement of profit or loss and credited to the statement of financial position
8. Depreciation is not allowed in the UK for taxation purposes.
9. Land is not usually depreciated as it has an infinite life.

#### Coding

1. The student demonstrated understanding of one of the expert propositions from an **expert perspective** as per the accounting textbooks (A1 to A7 and A9) in Study 1.

2. The student demonstrated understanding of one of the expert propositions from a **novice/naive perspective**.
3. The student demonstrated very little or **incorrect understanding** of the concept.
4. The student appeared to demonstrate understanding of the concept from a **different disciplinary perspective** such as economics or finance.

### Conceptual framework

The coding system was used to initially analyse the students' responses to see if their understanding was from a naïve or expert perspective as this has been identified as a problem with depreciation (Lucas, 2000). However, after this it was necessary to take a much deeper examination of the type of knowledge that the students were displaying and so Perkins' work (1999 and 2006) is used as a conceptual framework in Study 3. Analysis of the students' responses showed what makes depreciation so troublesome.

### Results

It was found that most students understood depreciation from a naïve, everyday perspective. This paper uses the terms 'naïve view' and 'expert view' when examining students' responses. A naïve view will have arisen from everyday usage or layperson's viewpoint, whereas an expert view is that used within the discipline. These are used in a similar way to how 'alternative' and 'authorised' views are used in Lucas and Mladenovic's 2009 work.

Expert Proposition	Code			
	1 Expert	2 Naive	3 Little	4 Econ/Fin
1. Depreciation is subjective.	1		2	
2. Depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life' (IAS 16).	7	86	20	4
3. The asset's cost is matched to the revenue it assists in generating. Accruals/matching concept.	5		1	
4. If an entity is a going concern, it must depreciate its non-current assets. If it is not a going concern, the assets will be held at resale value. Going concern concept.			1	
5. Depreciation is not a cash expenditure.	6	1	5	
6. Depreciation is an accounting estimate of the consumption of an asset.	1	2		
7. The expensed cost is charged (debited) to the statement of profit or loss and credited to the statement of financial position	8	6	36	
8. Depreciation is not allowed in the UK for taxation purposes.		2	3	
9. Land is not usually depreciated as it has an infinite life.		1	9	

Each proposition will now be addressed in turn.

1. Depreciation is subjective.

Clearly, this is not something that is understood by the students as only one student truly understood it and two touch upon it.

2. Depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life'.

Only seven students (6%) displayed understanding of depreciation from an expert perspective whilst 74% understood it from a naïve perspective, 17% showed very little understanding and 3% showed understanding from the disciplines of economics and finance. Clearly, the expert view needs to be taught more explicitly.

3. The asset's cost is matched to the revenue it assists in generating.

Only six students mentioned the matching concept, of which five did so from an expert perspective. The matching concept is central to understanding financial accounting, as without it students would not fully understand how to treat revenue and expenditure in the financial statements and so they would be expected to have mentioned it more frequently. It is possible they understand the concept but not its relationship with depreciation.

4. If an entity is a going concern, it must depreciate its non-current assets.

The going concern concept is something that needs to be made more transparent in our teaching as only one student touched upon it. This concept is fundamental to financial accounting as it determines the way the financial statements are prepared, either on an ongoing or break-up basis, dependent upon whether the business is going to continue trading.

5. Depreciation is not a cash expenditure.

Of the twelve students who mentioned this, half did so from an expert perspective. We cannot know whether the students who did not mention this believe depreciation to be a cash expenditure, or whether they think it obvious that it is just an accounting adjustment and so not worth being mentioned.

6. Depreciation is an accounting estimate of the consumption of an asset.

Of the three students who mentioned this, only one did so from an expert perspective. It is expected that students would struggle to understand that depreciation is only an estimate as they are still grappling with the idea of depreciation, and accounting as a whole, being subjective.

7. The expensed cost is charged (debited) to the statement of profit or loss and credited to the statement of financial position

Of the fifty students who referred to this, only eight did so correctly. Students should understand the bookkeeping aspect of depreciation, as the first year of the degree programme focuses on the mechanics of accounting rather than the more subjective aspects.

8. Depreciation is not allowed in the UK for taxation purposes.

None of the students recognised that depreciation is not allowed for tax purposes and all five who mentioned it believed it to be permitted. In fairness to the students, it is not mentioned in the lecture materials and they will not have studied any taxation at this stage.

9. Land is not usually depreciated as it has an infinite life.

Only ten students mentioned land, all believing that it is depreciated despite the lecture materials stating that this is not usually the case. It is a somewhat difficult concept to understand as globally there is a finite amount of land, but it usually is considered to have an infinite life.

### Critique of research

The question given to the students was the same one put to students by Lucas and Mladenovic in their 2009 work. In hindsight, this question may have been too vague, and it would have been better to ask directly: 'what does depreciation mean from an accounting perspective?' The students were also only given a maximum of ten minutes at the end of the seminar and this was inadequate for some students to be able to think about the topic and then write something. It explains why many of the answers were very short, with the weakest students only managing to write one sentence and none of the answers exceeding one page.

It was difficult to analyse the students' scripts as a solitary exercise and doing so has been a criticism of some threshold concept research (Nicola-Richmond, et al., 2018). Usually when this sort of analysis is carried out there is at least one other researcher to share the burden and discuss cases where responses do not obviously sit in one particular category. It did not seem appropriate to ask the other seminar leader who assisted with the data collection to assist with coding, as he is an hourly-paid lecturer and the school would not reimburse him for his time for this sort of activity. This can be rectified in future research by applying for funding from a faculty teaching enhancement grant.

As the students were not tested prior to our teaching, we cannot know which students have benefitted from our teaching, as some students will have previously studied accounting at 'A' level. Therefore, future research could address this as it has been a criticism made of threshold concept research to date (Nicola-Richmond, et al., 2018).

### Summary

We can see that only a minority of the students are displaying an expert view, with most students only understanding depreciation from a naïve perspective. There is also little understanding of the accounting concepts such as accruals and going concern that contribute to an understanding of depreciation.

It was apparent that students failed to understand the subjective nature of depreciation. This is because the students are at the start of their learning journey and will expect there to be one definitive answer. As they move into their second year, we will be able to demonstrate to them the subjective nature of accounting, but it is not made that explicit in the first year for fear of confusing them. An area for future research would be to examine second and third year students to see when they start to recognise the subjectivity of accounting, and if and when they do eventually understand depreciation from an expert perspective. If we could identify this, it could aid the teaching of students.

## Study 3 - Identifying the troublesome nature of depreciation

This final study uses David Perkins' troublesome knowledge framework to examine the students' responses in greater detail and so show the troublesome nature of depreciation.

### Ritual knowledge

The majority of students demonstrated ritualised learning by memorisation. The teaching at this stage is focused on method rather than theory, which perhaps encourages ritualisation. Of the forty-five PowerPoint slides used for the two-hour lecture on depreciation, only four

focused on the theoretical aspects of depreciation (what/why) with the vast majority of the slides focusing on depreciation methods (how). The problem with simplifying a threshold concept, as appears to be the case with the teaching on the first year financial accounting module, is that students may fail to grasp it but if it is revealed too early for the learner, fear may prevent them from crossing the threshold (Shanahan & Meyer, 2006). This is echoed by Lucas and Mladenovic (2007, p. 244) who have noted that lecturers try 'to make accounting look "easy"' by avoiding discipline-based terminology when often more complexity is required. Therefore, there is a fine balance between over-simplification and undermining the importance of a topic.

A commonly given naïve explanation was that 'depreciation is where an asset that a business owns loses its value over time' (Student 53) often followed by an example demonstrating one of the methods of depreciation:

'Straight-line

(Cost – residual value) / Useful economic life' (Student 56)

Students frequently used numbers and formulas when they struggled to explain depreciation. However, the beginning of understanding was present and they can build upon what they have memorised.

Many students focussed on depreciation methods such as straight-line and reducing balance rather than the reason for depreciating. Although many students are unable to remember the names for the different methods:

'Calculating depreciation can come in three forms, fixed depreciation and the others'.  
(Student 80)

This is very vague. Fixed depreciation would refer to the straight-line method, which the student went on to attempt to demonstrate. They are clearly aware there are other methods but are unable to recall them and here even ritual knowledge has failed them.

Straight-line depreciation, which we saw correctly demonstrated above by Student 56 is considered the easiest method of depreciation but the same student was unable to fully recall the more complex formula for the reducing balance method:

'( Carrying value %)

They almost have it correct as it should be 'carrying value multiplied by given or calculated %'. They are clearly aware that it is not quite correct, hence the gaps they have left. Ritual knowledge has failed them here probably because in the first year we always give them the percentage to apply to the carrying value, whereas in real-world situations they would have to calculate it using a complex formula.

Student 30 confused depreciation methods with stock valuation methods, which are completely unrelated. They are relying on ritual knowledge and attempting to recall accounting terms they have heard used, although through lack of engagement they are using the terms incorrectly.

It is problematic when students memorise incorrect information. Some students hold the incorrect belief that depreciation is allowed for tax purposes, which is incorrect in the UK where capital allowances are given instead at predetermined rates set annually by HM Revenue and Customs (HMRC). This prevents accountants using depreciation to manipulate profits. By allowing for capital allowances instead of depreciation, HMRC are controlling the flow of asset expense (and tax relief), thus removing subjectivity. Depreciation creates

subjectivity as accountants decide which method, rate and residual value to use, often on quite a rudimentary basis, which decreases comparability between businesses and so is not permitted by HMRC. All the students who mentioned taxation did so incorrectly and in almost exactly the same way:

'Business depreciate long term assets for both tax and accounting purposes'.

(Student 16)

'Businesses depreciate long term assets for both tax and accounting purpose'.

(Student 110)

'... every business tend to depreciate their long term assets due to tax and accounting purposes'.

(Student 33)

These responses are almost identical to Investopedia's definition (see Appendix 3), which students appear to have read and memorised. They are advised to avoid using websites, particularly American ones as the legal, accounting, and tax systems are different. However, students still prioritise web searches over academic sources, perhaps because they are so accessible, despite them often being inaccurate. As a compromise, we have permitted students to use 'legitimate' websites such as UK government agencies and professional accounting bodies. However, the students do not have the research experience to distinguish these from less reputable sites.

Therefore, there was a frequent display of ritual knowledge, with varying degrees of success. Hall et al. (2004, p. 490) noted that accounting students are more likely to concentrate on ritual knowledge and 'adopt higher surface learning approaches and lower deep learning approaches' than students from other disciplines. This is likely to be because accounting is seen to be 'a subject to be passed' (Lucas, 2000, p. 487) rather than enjoyed.

### Inert knowledge

Shanahan and Meyer (2006, p. 108) explain that inert knowledge is difficult to distinguish from ritual knowledge as "it is expressed in a similar 'wooden' and 'unconnected' way". In their study of economics students, they are impressed that a student tries to explain opportunity cost by relating it to their own experiences of whether to watch television or study, but are disappointed that the student reverts to a 'food or weapons' example which the student feels is 'better' as they have been taught it and feel this to be the superior knowledge. When students have mastered a subject, they can apply their knowledge to different, unrelated scenarios whereas in the novice stage they are unable to be dynamic and can usually only apply knowledge to similar situations.

The accounting students surveyed did not obviously display inert knowledge as this is knowledge without context. Many of the students tried to give examples of assets falling in value to show, from a naive perspective, the underlying reason for depreciation. When they gave examples of assets depreciating they tended to focus on motor vehicles, as they are very aware they lose value and may even have first-hand experience of this:

'With depreciation the value of an asset such as a car would drop over the year. For instance if the asset was purchased at a value of £10,000, by the time you left the car sale the value has already dropped to £9,999. Hence it can overstate statements of financial position.'

(Student 13)

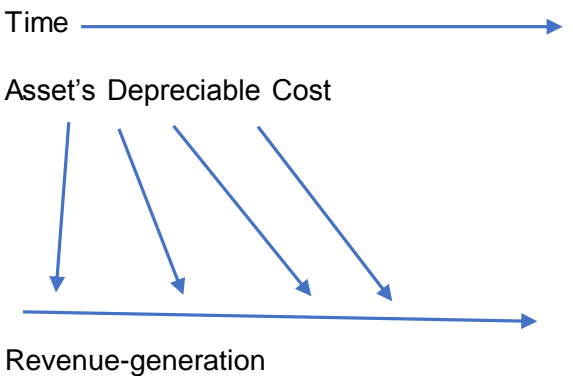
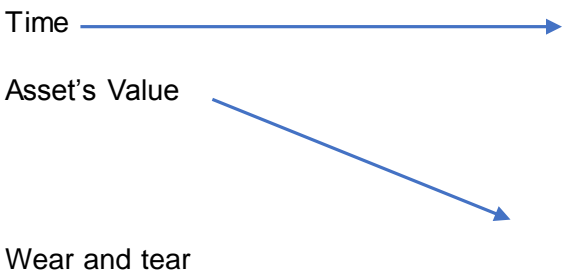
This student is demonstrating the naïve view of depreciation being a fall in value although have bizarrely estimated a fall of only £1 following collection of the car. This does, however, attempt to give context to their explanation. They have also attempted to link the fall in value to the financial statements, although incorrectly. Therefore, whereas Shanahan and Meyer's student tried to relate their knowledge to their own situation but gave up, this student has stayed with it, albeit in a somewhat muddled fashion.

Lucas (2000) discovered that students found it difficult to relate accounting to their own situations. This is understandable to a certain extent as most students will not have any accounting work experience to relate their studies to, but even those that have failed to make the connection. Lucas noted that a student working in their family's business expected to work long hours for the success of the business, but failed to see that the full 'cost' of this would not be reflected in the business's financial statements.

To prevent knowledge from becoming inert Perkins recommends that the teacher involve the students in an active way, such as problem-based learning which moves students away from ritualization, encouraging them to apply what they learn. In our teaching of accounting, we attempt to aid students' learning by getting them to practise what they have learnt by applying it to computational questions thus contextualising their learning. However, Winslow (2011, p. 128) is critical of this method as it is time-efficient for the teaching staff, with students rapidly moving on to another topic, but without them really considering the importance of what they have learnt. He picks up on Chevallard's term 'visits of monuments' which likens students to tourists rushing from monument to monument, taking photographs without truly appreciating the experience.

### Conceptually difficult knowledge

The table below shows how the accounting discipline view of accounting, on the left, differs from the students' view.

Accounting definition of depreciation	Students' version based on real-life experiences
	

Conceptually difficult knowledge arises from confusing a layperson's understanding of depreciation with discipline-based rules and terminology. Students will focus upon the economic aspects of depreciation, that wear and tear of assets causes them to fall in value. This is certainly the case in reality, and they will have experienced this through ownership of electronic devices and motor vehicles. For example:



'Depreciation is the decrease in an asset's value over time and with use. For example a brand new car is worth more than a pre-owned car because the pre-owned car has been used and parts could be worn etc...'

(Student 69)

This student's explanation is acceptable from a naïve perspective, but they seem unaware of the expert view. It is for this reason that they will not consider depreciation conceptually difficult and so they are unaware of how troublesome the concept is.

Students will not consider depreciation from an accounting perspective, which is an asset being expensed over its revenue-generating life, as they have no experience of this. Students understand how machinery is used in the manufacture of products. Student 108 mentioned a sewing machine at a garment factory, and so may be able to see how this machinery is contributing to revenue creation but may struggle to see the connection with a remoter asset such as a building. Expensing a building over the period the business is expecting to hold it for is a complex concept even for an expert to understand. This is apparent having had to remind a colleague recently that depreciation is not seeking to calculate a market value.

Student 109 recognised that an asset helps to generate revenue but does not recognise that this is why it is depreciated in the financial statements.

'Depreciation is where over time an asset loses its value. For example if a company were to purchase an expensive but valuable type of machinery which they would use to generate income, over time it may become less valuable as a result of wear and tear...'

Student 109 has not seen the link between income generation and depreciation as they still see depreciation from a naïve view, believing the usage to have driven a fall in value.

Students often fail to appreciate that depreciation is only an estimate and that there is no outflow of cash, thus bringing subjectivity into the accounts. Student 51 has incorrectly given the double entry for depreciation:

Debit: depreciation

Credit: cash'

This shows that they incorrectly view depreciation as an outflow of cash. The correct double entry would be:

Debit: depreciation expense for the year (Statement of Profit or Loss)

Credit: accumulated depreciation (Statement of Financial Position).

The double entry above shows the relationship between the two financial statements whereby the expense (debit) is matched to the revenue it helps to generate in the Statement of Profit or Loss, thus reducing profit. The credit reduces the value of the non-current asset in the Statement of Financial Position and the cash balance is unaffected.

Student 50 stated that depreciation 'does not really decrease the value of your profit' and 'does not reduce the cash balance of your bank'. They are correct that cash is not affected and although depreciation does reduce profit they have at least recognised in a naïve way that profit is subjectively affected. We can see that they are starting to see the relationship between cash and profit but are having difficulty correctly expressing it.

Depreciation is clearly conceptually difficult for accounting students, as only 6% of the students were able to give the expert definition of depreciation (Expert proposition 2). An example of one of the students who can be seen to have acquired depreciation as a threshold concept:

‘Depreciation is the process of spreading the cost of an asset over its useful life.

It is important to account for depreciation according to the matching and prudence concept[s] so as not to overstate profit and to account for all expenses during a particular period.’  
(Student 118)

This is a model answer as the student goes on to explain which assets would be depreciated and how the depreciation is treated in the financial statements. It would have been valuable if we could have tested the students on arrival, as this student may have studied accounting before.

The results show that 94% have not acquired this threshold concept. We can only attribute it to the expert view not being explicit enough in the teaching materials. There is only one PowerPoint slide out of the forty-five used in the lecture that mentions the expert view. However, there is no mention of it being different from the naïve view, which is also mentioned on the same slide. The problem is that students believe that depreciation is accounted for because of the naïve view, rather than as a mechanism to expense the asset.

### Foreign/alien knowledge

As previously explained, depreciation from an accounting perspective is conceptually different to everyday experiences and so it is alien and unsettling. We are not asking students to abandon what they have experienced and know to be true, but are asking them to add another dimension. This issue has been identified as an overgeneralised domain of validity (Sommeillier, et al., 2018). The everyday domain of validity, in this case that depreciation is a fall in value from wear and tear etc., is being incorrectly extended into the accounting context thus creating misconceptions. Here, misconception is taken to mean incorrect understandings that remain after teaching has taken place (Vosniadou, 2012). This can be corrected by giving students the IAS16 definition and explaining that its domain of validity is the accounting discipline.

Depreciation requires students to understand the accruals, prudence, and going concern concepts, periodicity and the relationship that exists between the financial statements, which is very demanding and alien to them. Only a few of the students demonstrated an understanding of accounting concepts, with most just relying on ritualised knowledge and failing to show a deep understanding of the subject.

Depreciation is a concept that is taught in economics and has a clear importance, although in literature to date has not been considered a threshold concept within economics. We have already seen that the terminology is somewhat different to that in accounting. The teaching of the same concept from different perspectives has clearly caused confusion for some students. For example:

‘Depreciation can be described as the fall in value of capital. Things such as plant, machinery, buildings and cars can be affected by depreciation.’ (Student 2)

This student is using the term ‘capital’ from an economics disciplinary perspective, as seen in Sloman’s definition in Study 1, when in accounting we would use the terms ‘non-current assets’ or ‘fixed assets’. It may be that this student is studying for joint honours in

economics, hence the misunderstanding which was only replicated by four other students. It would have been useful, in this instance, to have biographic data.

In Study 1, we saw that in economics depreciation can refer to a fall in value of a currency and was also mentioned in 'A Dictionary of Accounting'. This was mentioned, in a confused way, by Students 4 and 5, but it was not clear if they were trying to recall this from their economics module or were trying to discuss inflation. Accounting lecturers need to be aware that students may become confused by what they learn in other modules so that the lecturers can make the differences explicit to their students.

Students fail to see the subjectivity of accounting to which depreciation contributes. Students display an absolutist view (Lucas & Tan, 2013) as they believe depreciation gives the asset's 'true value', which was frequently mentioned (e.g. Students 51, 58, 82). This is not accounting terminology and one wonders where they have picked this up. They also thought depreciation gave the resale value when all it does is provide a net book or carrying value for the statement of financial position.

Student 113 stated that 'depreciation is used to determine the value of assets'. As Lucas and Mladenovic (2006, p. 155) found, students are confusing 'value in use' with 'value in exchange' and see depreciation as a way of calculating a resale value so that as Student 26 stated: 'if you need to sell an asset, you will then know its current worth'. This student has misunderstood the purpose of depreciation. The going concern concept does not require a business to carry its assets at resale value unless the business is no longer a going concern, is likely to be wound up within the next twelve months, and so needs to sell its assets as part of the liquidation process. It is obviously quite difficult to show assets at resale value as you will not know how much you can sell them for until they are sold. Assets often have a higher value in use than resale value, particularly if the entity uses specialist equipment or the assets are old but still function.

As Perkins (2006, p. 39) points out, often 'the learner does not even recognise the knowledge as foreign'. For students, the difference between the naïve and expert views of depreciation is so subtle that they do not acknowledge it. It is only as they progress through their studies when they fully understand the concept of depreciation that they realise it is alien to their naïve view. Once they pass this threshold, they will be transformed and it is unlikely that they will forget this new piece of knowledge.

### Tacit knowledge

Tacit knowledge is that what we are barely aware of and so is difficult to pass on to others or as Michael Polanyi famously said, 'we can know more than we can tell' (Grant, 2007, p. 174). Much of what we do in any profession, including accounting, relies on tacit knowledge. Students can only truly grasp tacit knowledge through professional practice by observing a professional and mimicking their behaviour.

Most of the students on the first year of our accounting programme are under twenty years of age and so have little life experience. They find it difficult to distinguish their behaviours from those of a practitioner, as they are not yet able to 'think like an accountant'. It goes back to foreign knowledge and not being able to recognise what they do not know.

It is difficult to evidence a lack of tacit knowledge in the students' work concerning depreciation. It is seen when students are tackling a more practical task such as the preparation of financial statements. However, by asking students to explain depreciation it is not possible for them to demonstrate tacit knowledge or a lack of it.

## Summary - The troublesome nature of depreciation

### Troublesome language

Many students displayed a lack of familiarity with accounting terminology. For example, incorrectly referring to non-current assets as 'objects' and 'products', referring to an asset's 'current value' rather than its net book value, and referring to an asset's 'shelf life', as if it were inventory, rather than referring to its useful economic life. Students at this stage will not be aware of subtle differences in terminology, particularly if their first language is not English.

International students can be particularly disadvantaged when trying to express their understanding of a threshold concept, especially if their first language is not English, as they are grappling with unfamiliar language and subject content. Shanahan, et al. (2006) tried to adjust for this by using multiple-choice questions when assessing threshold concept acquisition in economics. However, they still found problems and suggest this is not just a language barrier but also a cultural one. They suggest that the 'mental reorientation' is greater for those 'who come from cultures whose values or norms are perceived (by the student) as being at odds with the concept itself' (Shanahan, et al., 2006, p. 43). One of the characteristics of a threshold concept is that it should be transformative, that it will change the way we see the world. Perhaps this is a greater change for those with a different cultural background.

### Summary

We have seen that depreciation is troublesome because of misconceptions that students bring with them from everyday life and it is difficult for them to grasp the discipline view, which may be compounded by economics teaching. Depreciation is conceptually difficult as there is a requirement to view business activity in an unfamiliar way. The integrative nature of depreciation is problematic, as it cannot truly be understood until other accounting concepts are also understood. Students will need to understand several concepts at the same time, before they can acquire depreciation as a threshold concept, but until then will rely on ritual knowledge.

Depreciation contributes to the subjectivity of accounting, and students are unsettled when there is not a definitive answer as this is not expected from a numerically based subject. A study of later stage students would hope to see a move away from an absolutist view, and the gaining of depreciation as one of a number of threshold concepts in accounting.

## Conclusions

Depreciation is a threshold concept because of its troublesome nature arising from misconceptions and different views. It has been demonstrated that depreciation is a difficult threshold concept for students to acquire as they rely on the naïve view. The root of the troublesomeness is that students fail to recognise that in accounting depreciation has an alternative or expert view which is central to the mastery of accounting. It was also seen that the economics view of depreciation supports the naïve view and so may cause further complications.

In order to assist students in acquiring depreciation as a threshold concept the teaching of accounting needs to be made more technical, and the distinction between the naïve and expert views of depreciation made more explicit. This can be dealt with by explaining that a student's understanding of depreciation is that of a layperson and is correct outside of accounting and within economics. This would be followed up with the IAS 16 definition, thus

making the discipline view much more transparent. The teaching would be finalised with a demonstration of how depreciation is calculated and treated in the financial statements.

Attempting to simplify accounting should be avoided as this will cause confusion for the students later in their studies. This has been noted by Shanahan and Meyer (2006, p. 113) as “efforts to make threshold concepts ‘easier’... set students onto a path of acquiring ‘ritualised’ knowledge that may actually prevent them from crossing the threshold”. It has been seen that the students examined are just at the beginning of their learning journey, and with the support of good teaching should be able to acquire depreciation as a threshold concept along with many others along the way.

This dissertation builds upon Lucas and Mladenovic’s 2007 and 2009 work, which identified that students have misconceptions of depreciation arising from differences between everyday language and accounting terminology. This work goes further by looking at a large cohort of accounting students’ understanding of depreciation by comparing their responses to expert propositions and Perkins’ framework. To date, this has not been seen in accounting research, which usually takes a phenomenographic approach looking at fewer students.

Perkins’ framework is of value as it examines what type of knowledge the students have and from this lecturers can see where corrective action is needed. By knowing the root of the troublesomeness, lecturers can see where to concentrate their teaching. We have seen that the students are relying on ritual knowledge and need to expand upon this by forming an expert view of depreciation. Furthermore, the examination of the differences in terminology between accounting and economics has not been researched before. This shows that the troublesome nature of depreciation is more complex than previously thought.

The findings of this study are consistent with the work of Sommeillier, et al. (2018) who found that students demonstrate an overgeneralised domain of validity. This means that students will expect a model, example or some other teaching to apply in all situations. In this study, the students are trying to extend the naïve view of depreciation into the accounting discipline. It has been suggested (Sommeillier, et al., 2018) that getting students to confront an overgeneralised domain of validity will aid learning. They recommend showing students where the knowledge holds true and where it does not. This could be examined in a future study of accounting to see if students grasp threshold concepts quicker when presented with this method. It would be valuable to examine students over their university career, as depreciation is a difficult concept to grasp and we have seen that few understand it properly within their first year of accounting studies.

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## Appendix

### Appendix 1 – Student survey

#### Depreciation revision task

#### **How would you explain what depreciation is to a new business owner?**

Write out your explanation below. Explain it as clearly as you can, using simple language, examples, and in the context of the business and financial statements as a whole.

Lucas and Mladenovic (2009) used this same survey question.

### Appendix 2 – Corrective action/feedback

#### **AC300 - Depreciation Notes**

Depreciation is the 'systematic allocation of the depreciable amount of an asset over its useful life' (IAS 16), thereby apportioning the cost of the asset over multiple accounting periods.

'The depreciation process makes no attempt to show assets at their current values. Nor does it guarantee that there will be funds available to replace those assets when they come to the end of their useful lives. Depreciation charges reduce profits but have no direct effect on an entity's cash resources and do not ensure that cash is "saved up" to buy replacement assets.' (Melville, 2017)

#### Terminology:

#### **Historic Cost**

The amount actually paid for the non-current asset.

#### **Depreciable Cost/Amount**

The amount of the historic cost that is to be regarded as an expense over the period of the asset's useful life.

E.g.

Asset Cost £105,000 on 01/01/2010

Expected usage: 5 years

Scrap/Residual Value £5,000

Therefore, the depreciable cost is £100,000 (cost 105,000 – scrap value 5,000).

#### **Depreciation Charge**

Amount charged to the statement of profit or loss to spread the cost of the non-current asset over its useful economic life.

#### **Accumulated Depreciation (Provision for Depreciation)**

The total amount of depreciation that has been charged over the asset's life to date.

**Historic Cost - Accumulated Depreciation = Net Book Value (NBV)** (goes on the Statement of Financial Position).

### **Straight-line method**

$$\text{Depreciation} = \frac{\text{Cost} - \text{Estimated Residual (Scrap) Value}}{\text{Estimated useful life in years}}$$

The same amount of depreciation is charged each year as an expense.

The asset falls in value evenly throughout its useful economic life. Therefore, most appropriate for assets which are consumed by the entity in an even way/through the passage of time, e.g. buildings, leases, patents, trademarks.

Advantage(s): easy to calculate/understand.

### **Reducing-balance method**

Applies a fixed depreciation rate to the asset's NBV (or cost in the first year). The asset depreciates the most in the first year and the amount falls (reduces) each year. Therefore, most appropriate for assets that depreciate because of usage.

Advantage(s): Often mimics how assets actually depreciate, i.e. most heavily in early years, e.g. motor vehicles, IT.

Disadvantage(s): Not so easy to calculate/understand.

### **Sum of the years' digits method**

Weight is attached to each year of the asset's life. The weight depends on the economic life remaining at the start of the year.

If applied to the above example:

Year	Remaining Life (Digits)	Dep'n in the year	Dep'n Charge
2010	5 years	5/15 x £100,000 depreciable cost	£33,333
2011	4 years	4/15 x depreciable cost	£26,667
2012	3 years	3/15 x depreciable cost	£20,000
2013	2 years	2/15 x depreciable cost	£13,333
2014	1 years	1/15 x depreciable cost	£6,667
	Sum of the years' digits = 15 i.e. 1+2+3+4+5		£100,000 Total

The asset will depreciate the most in the first year and the amount falls (reduces) each year.

Advantages and disadvantages are the same as for the reducing-balance method, although rarely used in the UK.

#### Appendix 3 – What is ‘Depreciation’? A definition from a web search

‘Depreciation is an accounting method of allocating the cost of a [tangible asset](#) over its useful life. Businesses depreciate [long-term assets](#) for both tax and accounting purposes. For tax purposes, businesses can deduct the cost of [the tangible assets](#) they purchase as business expenses; however, businesses must depreciate these assets in accordance with [IRS](#) rules about how and when the [deduction](#) may be taken’.

<https://www.investopedia.com/terms/d/depreciation.asp#ixzz58VB502KV>

Downloaded 01/03/18.