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Using word clouds to develop proactive learners

Frances Miley[1] and Andrew Read[2]

Abstract: This article examines student responses to a technique for summarizing electronically available information based on word frequency. Students used this technique to create word clouds, using those word clouds to enhance personal and small group study. This is a qualitative study. Small focus groups were used to obtain student feedback. Feedback indicated that students adapted their use of word clouds in ways consistent with their learning style preferences. Kolb's learning styles inventory was used. Student response also indicated that word clouds have potential in the workplace.

Key words: accounting education, deep learning, graduate attributes, Kolb's learning styles inventory, motivation, workplace learning, word clouds.

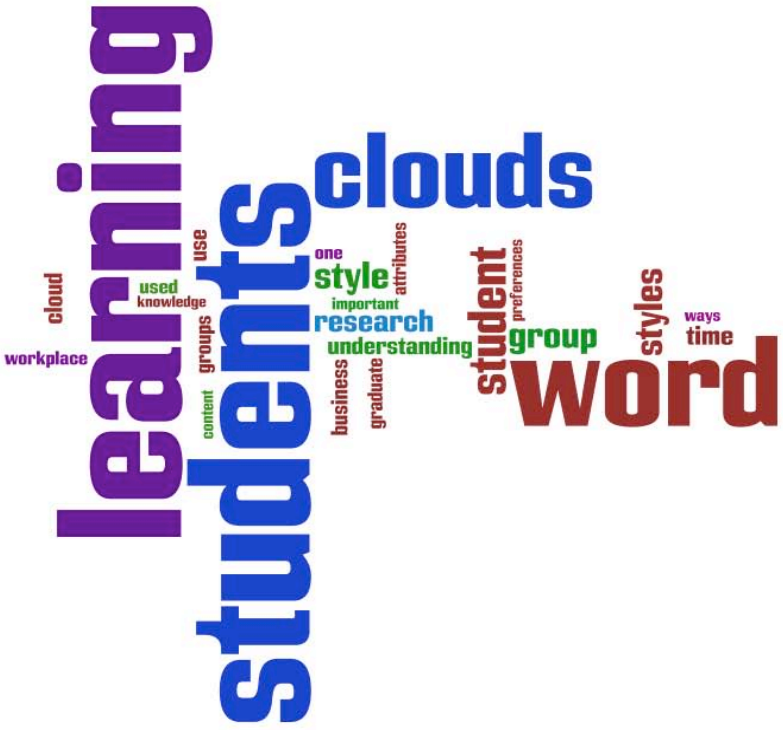

Figure 1. Wordle word cloud of this article.

> Give a man a fish and he will eat for a day. Teach him how to fish and he will eat for a lifetime (Chinese Proverb).

In 2009, an informal survey of 69 final year undergraduate students studying accounting as part of a Bachelor of Business degree program indicated that their main concern was that employers expected them to remain current with business developments but many confessed they were overwhelmed by the amount of information this involved and at the rate of entry of new information. In particular, they were concerned about how to remain familiar with the breadth of information and summarize it to ensure depth of understanding. The students

[1] University of New South Wales at the Australian Defence Force Academy
[2] University of Canberra

expressed a lack of confidence with managing knowledge acquisition in a workplace, stating that they did not think their present studies fully equipped them for this task. To assist them in developing this skill, the students were introduced to word clouds. Word clouds provided a tool to assist current learning and with summarizing workplace information. The potential of word clouds to assist with the conflict between the plethora of internet material versus our limited reading time has been recognized (Godwin-Jones, 2006). The success of using word clouds as a learning tool with potential to assist with workplace information management is described in this article.

I. Word Clouds.

Word clouds developed from web based social networking sites, which are web sites that allow a group of common users to share information. Social networking sites may be closed, such as the ones that operate within specific organisations, or open sites freely available to any Internet user. Popular open use sites include MySpace, FriendWise, FriendFinder, Yahoo! 360, Facebook, Orkut, and Classmates. The concept of word clouds developed from the tags or descriptors used to identify photographs posted to social networking sites such as Flickr, a site specifically designed for multiple sharing of photographs. The concept quickly extended to other websites that allowed users to tag their favourite books or identify their favourite web sites. Other users could search for these tags as an indicator of popularity, although they could not know about the bias or reliability of the tags. Word clouds have been viewed as a useful adjunct to teaching reading and writing skills (Hayes, 2008) and for summarizing research interviews (McNaught & Lam, 2010) but there is a dearth of research into their use to enhance student learning.

Word clouds, also called tag clouds or a weighted list, are a visual depiction of the frequency tabulation of the words in any selected written material, such as lecture notes, a textbook chapter or an internet site. Font size is used to indicate frequency, so the larger the font size, the more frequently a word is used. A word cloud abstract from the content of this article is provided above as an illustration. To create this abstract, an internet program freely available at www.wordle.net was used. Wordle allowed us to set features such as the number of words included, font, layout and color. We could delete common words such as conjunctions and prepositions but could neither insert nor delete nouns, verbs, adjectives or adverbs. The word cloud abstract represents the words used most frequently in this article within the parameters we could set. Wordle was the program used by the students referred to in this article. The advantage of word clouds is that they create a simple visual image. They emphasize the most frequently used words, allowing students to focus on them and reflect upon whether they would have emphasized the same words. Word clouds can act as a memory jogger about previously read material or a summary of written material, providing a useful aid when students are revising for examinations. Disadvantages of word clouds are that because they prioritize words by frequency of use, key concepts may be excluded because the words used to describe a concept appear infrequently, terms comprising more than one word, such as “word clouds” are treated as two separate words, and the word cloud created in Wordle can only be altered within pre-set parameters. The primary purpose of this research is to introduce word clouds as a learning tool adaptable to any discipline area.

The secondary purpose is to explain how the accounting students proactively adapted the way they used word clouds. This illustrates the flexibility of the technique. However, students tended word clouds only in ways consistent with their learning style preferences, which may have limited their value as a tool for individual learning because it suggests that they were only open to learning techniques in their comfort zone rather than those which were challenging to them. The strong tendency for the accounting students to use word

clouds only in ways consistent with their learning styles may have been an anomaly or coincidence; the relatively small size of the group (69 students) and short time frame involved in this research (two semesters of 13 teaching weeks per semester) increases the likelihood of mistaking coincidence for a significant outcome. In view of the lack of substantial prior research into the use of word clouds as a learning tool, it is not possible to know how generalizable the results of this research may be but it is possible to state that the tendency of students to use word clouds in ways consistent with their learning style preferences was so marked that further research is desirable into how students use word clouds, or more broadly, whether students constrain their use of learning tools to those consistent with or adaptable to individual learning style preferences and any implications for teaching and learning.

Students were shown how to create word clouds using material from lecture PowerPoints and internet sites. They were warned about the limitations of word clouds and to use them as an adjunct to rather than substitute for other learning techniques. In proactively exploring additional ways to use word clouds beyond those demonstrated in class, the students were taking ownership of and modify their learning processes to suit their individual needs consistent with a responsible approach to learning (White, 1988). Learning is more effective if students can take ownership of the method of learning and not only the content of that learning (Enghag & Niedderer, 2008).

After describing word clouds, the literature that underpins this research is canvased then student responses to using word clouds are explored. This article examines the content of focus group responses relating to the use of word clouds, how students adapted word clouds in ways consistent with their learning style preferences and the value students saw in using word clouds in a workplace. It provides an insight into how students used a learning innovation they viewed as having current and ongoing relevance.

Students were fully apprised of the limitations of word clouds. Although introduced as an optional learning aid to be used judiciously with other learning techniques, all students enthusiastically adopted word clouds to create summaries of lecture notes and Powerpoints for revision purposes. However, most went much further in their use of word clouds. When asked about this in voluntary focus groups, a distinct pattern emerged of students using word clouds in ways consistent with their learning styles preferences. In another context, students had previously undertaken self-assessment of their preferred learning style. Our concern was that this predisposed them to view their use of words clouds as consistent with what they knew about their learning style preferences. However, the students failed to detect that they were using word clouds in ways consistent with their preferences; it was academic staff who detected the correlation. Students seemed unaware of any link between how they used word clouds and their learning style preferences. In their view, to quote one student, “it just seemed the obvious thing for me to do”.

Focus group discussions also revealed that students thought the ability to create and use word clouds was an important graduate attribute for business students. Since they were all business students, their discipline based qualification reflects their proclivities.

II. Method.

The enthusiastic student take-up of word clouds was initially discovered from their informal comments during classes. This prompted independently mediated voluntary focus groups in which all students chose to participate. Focus groups of approximately 12 students per group facilitated by academic staff were used to seek feedback responses. In view of the lack of prior research into the use of word clouds to enhance student learning, it was considered important to obtain the richer data of a free flowing focus group discussion with minimal

intrusion from the facilitator. Responses were recorded *verbatim* and later transcribed. Although students were commenting on their experiences with using word clouds over two semester long periods, they had been using the language of learning styles for almost three years. The student demographic was that all but two students were of Australian ethnicity, with only four mature age students and a gender skew of 56 male and 13 female students. The non-Australian students were from New Zealand and Singapore. All students were enrolled in a Bachelor of Business degree program.

An important feature of the teaching strategy was a constructivist student-led approach to learning in which students worked in small self-selected groups to facilitate peer learning. Research indicates that working collaboratively is critical in many business environments (Angehrn & Maxwell, 2009; Ofstedal & Dahlberg, 2009) and identifies benefits in peer learning (Evans & Cuffe, 2009; Miley, 2004). Focus groups had the advantage that students could listen to the experiences of their peers and use them for comparative reflection against their own experiences. This was considered consistent with the constructivist philosophy, so that the opportunity to reflect on word cloud usage became part of student learning while also providing insight for academic teaching staff and for research purposes. Focus groups were also thought to provide richer data about the student experience than would have been gained from other forms of data collection, which seemed important in view of the lack of existing research into the use of word clouds. Focus groups created a space where students could largely control the conversation, consistent with a student-led approach to teaching.

In focus groups, students raised the issue of graduate attributes, and observed that their understanding of learning styles gave them knowledge about themselves and their understanding of word clouds gave them knowledge about the world outside themselves. The students commented that knowledge *management* skills, into which they classified word clouds, were critical in the workplace but currently ignored by universities, which concentrated on the knowledge itself. The literature on graduate attributes was accessed in response to focus group comments whereas the other literature outlined below provided the scaffolding for thinking about the role of word clouds in teaching and learning.

III. Literature Review.

In view of the lack of literature on word clouds, the focus in this section is on the literature that underpins this research on the approach to learning styles and teaching used, the importance of student ownership of learning techniques and word clouds as a workplace skill.

A. Learning Styles.

There are many approaches to classifying student learning style preferences (Byrne, Flood, & Willis, 2009; Dunn, 1984; Gardner, 1993; Haynes, 1998; Honey & Mumford, 1982; Lee & Hung, 2009; Marton & Saljo, 1997; Montgomery & Groat, 1998). The accounting students had previously completed Kolb's learning styles inventory as part of understanding their personal learning style preferences, so Kolb's four classifications of learning styles were used for this research. The advantage was that students understood Kolb's terminology so semantic differential issues did not arise in focus group discussions because there was shared meaning among the students and academic staff. Kolb's learning styles inventory has been criticised because it over-simplifies the complexity of learning accounting (McChlery & Visser, 2009) but McChlery and Visser (2009) could be criticised too. It was a two-country study that ignored cultural differences in learning and teaching quality, although these factors

are recognised as important to student learning and student motivation to learn (Leveson, 2004; Mitsis & Foley, 2009).

Kolb saw learners as having learning preferences described by two continua: a processing dimension ranging from active experimentation through to reflective observation, and a perception dimension ranging from concrete experience through to abstractive conceptualisation. This led to learners being defined by four categories representing the combination of their results on each continuum (see Figure 2). Kolb labelled the categories accommodating, assimilating, converging or diverging learning styles. Accommodators prefer concrete experiences and active experimentation. They manage hands-on, practical work well, particularly when they are able to undertake it themselves then build their understanding from their observations. Assimilators prefer to think something through and reflect on it. They are the students most likely to enjoy lectures as a form of learning. Although convergers conceptualise ideas, they then like to test the results with active experimentation, tweaking results until they are satisfied with them. Divergers prefer to move from concrete experiences to reflective observations. They are the students most likely to work from one practical example to thinking about how its results apply in other circumstances.

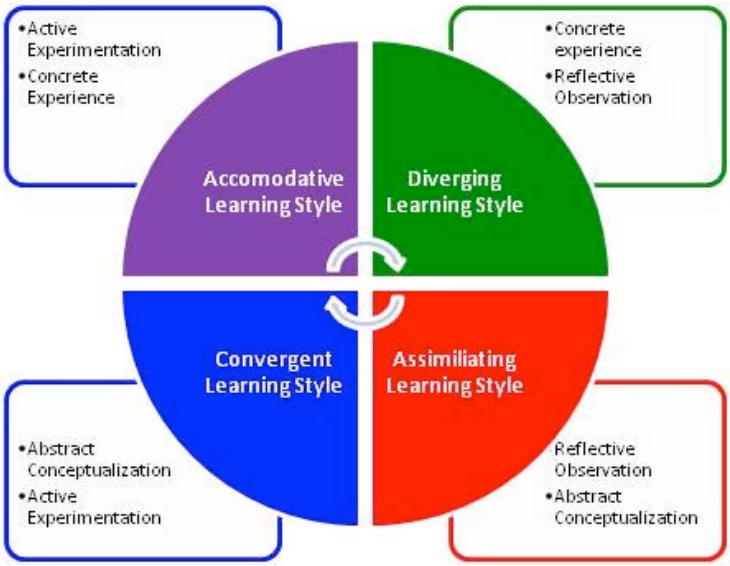

Figure 2. Learning styles: Source: David Kolb and Learning Styles, The Effective Development Leadership Community.

There is evidence that teaching materials should be presented in ways consistent with the learning style preferences of students to encourage students to engage in deep rather than surface learning.(Biggs, 1999; Entwhistle, 1981; Franzoni & Assar, 2009; Marton & Saljo, 1997). Although the dichotomy between deep and surface learning has been criticised as simplistic (Beatie, Collins, & McInnes, 1997), it continues to provide a useful way to understand and explain student approaches to learning (Lau, Liem, & Nie, 2008; Nelson Laird, Shoup, & Kuh, 2006). Some researchers include a third category called strategic learners (Gijbels, Segers, & Struyf, 2008; Papinczak, 2009). These are learners who will study in a deep way if a subject is set up so depth of understanding is required. Otherwise, they will only put in the amount of effort it takes to achieve what they perceive as a satisfactory result. It would seem unlikely that strategic or surface learners would bother to experiment with a learning tool so when the accounting students experimented with ways to

use word clouds more aligned to their learning preferences, it suggests they were engaging in deep learning. It is not suggested that their deep learning approach was due to the introduction of word clouds but simply that it appears consistent with such an approach.

B. Teaching Approach.

A constructivist student-led learning approach to teaching was used because it is recognised as providing a sound grounding for the workplace (Beckman, 1990). Students were introduced to learning style preferences for the same reason: it is recognised as knowledge valuable in a work environment (Boyle, 2005; Buch & Bartley, 2002; James-Gordon & Bal, 2001; Marsick & Watkins, 1990). This literature views any of the learning style models as workplace relevant because all provide deeper understanding about the workplace interaction.

A constructivist approach asserts that that learning should come from the student and not the teacher; the teacher's role is to create an environment in which the learner has the freedom to construct understanding (Baviskar, Hartle, & Whitney, 2009; Enghag & Niedderer, 2008; Gordon, 2009; Loyens, Rikers, & Schmidt, 2009). Teachers provide opportunities for students to build on prior experiences and learning, exploring possibilities and different solutions, learning as they solve problems (Derry, 1992, 1996; Steffe & Gale, 1995). Group learning techniques were used to encourage shared development of ideas. The constructivist approach has been criticized (Altun & Buyukduman, 2007; Liu & Matthews, 2005) but none of the criticisms invalidates the basic premise that the best learning is student led.

Students could elect to work in a group with students who had a similar learning style preference to their own (49 students), or different learning style preferences (20 students). From staff observation, groups with students who had the same learning style preference proved more harmonious than those with mixed learning preferences but tended to be less risk-taking in exploring uses for word clouds. The choices to work with like-minded peers or those who learn in different ways are of interest in themselves as they may give an insight into how groups function and explain why the group work by university students can be so unsatisfactory (Gottschall & Garcia-Bayonas, 2008) but that is not the focus of this research.

C. Student ownership of learning techniques.

Academic staff anticipated that introducing word clouds would motivate students to learn because it would was a new technique, easy to learn and a direct response to a need identified by the students. Motivated students are more likely to engage with all aspects of their learning (Ames, 1990; Brophy, 1986) and become responsible learners who take ownership of their learning (White, 1988). There is extensive research literature indicating that student learning is enhanced if students can be encouraged to take responsibility for their own learning (Enghag & Niedderer, 2008; Gibbs & Habeshaw, 1989; Gijbels, et al., 2008). They are more likely to do this if they are included in the process of how they learn, not just what they learn (Platz, 1994) and if their understanding has been developed from their own discovery (Borda, Kriz, Popejoy, Dickinson, & Olson, 2008; Boud, Keough, & Walker, 1985). The design flexibility of word clouds allows students considerable latitude in how they learn, customizing the design and in how to use the completed word cloud.

Student motivation is enhanced when they can develop alternative strategies or routes for attaining goals (Jones, Valdez, Nowakowski, & Rasmussen, 1995). Word clouds can be used in a variety of ways to learn but also, they have the flexibility of being able to be generated from any electronically available word content.

Motivation is a competence learned through factors including experience, understanding expectations, direct communication (Brophy, 1986) and influenced by extrinsic factors such as assessment weightings (Wormald, Schoeman, Somasunderam, & Penn, 2009). Since the creation of word clouds is giving students experience in selecting relevant content to summarize an electronic article, it should enhance motivation if students become enthusiastic about their use of word clouds.

Despite the acknowledged importance of student motivation in learning, this area is complicated by lack of an agreed definition (Ames, 1990; Maclellan, 2008; Marshall, 1987), inability to separate motivation from intelligence (Schick & Phillipson, 2009) and cultural factors (Matsumoto, 2009), and difficulty distinguishing motivation from other factors that make students responsible and engaged learners. There does seem to be a clear understanding that a motivated student is someone who is self-motivated to learn. If students adopted word clouds as a new learning tool when they were at the tail end of their degree studies and would be expected to have set study habits, this would suggest they were self-motivated and responsible learners. This is not meant to suggest that more motivated students would use word clouds more frequently or more creatively than less motivated students but that willingness to experiment would appear to be consistent with a motivated student. What academic staff did not foresee was how powerful word clouds as a learning technique would be because students could adapt them to individual learning preferences and that this would be evidence suggestive of responsible self-motivated learning.

D. Developing Workplace Skills.

Research has recognised the value in the workplace of a knowledge of learning styles (Marsick & Watkins, 1990). The global financial crisis has surely highlighted that business decision makers must be responsive to changing external and internal environments but how can they respond unless they remain current with relevant events, business strategies and responses? Long before the global financial crisis, this was recognized in the research literature as an important attribute for graduates to possess (Barnett, 2006; Barrie, 2008; Hager & Holland, 2006; Hager, Holland, & Beckett, 2002). Previously, research has not provided guidance on how to equip students to manage it. Word clouds are offered as a response technique. Perhaps universities do not seem to have responded the research literature in this area because of the lack of common understanding about what constitutes graduate attributes (Barnett, 2006; Barrie, 2004, 2007; Green, Hammer, & Star, 2009; Hager, 2006; Kember, Leung, & Ma, 2007), which attributes matter (Sutcliffe & Cummings, 2007), how to incorporate graduate attributes into teaching (Al-Mahmood & Gruba, 2007; Clarkson & Brook, 2007; Treleaven & Voola, 2008) and the difficulty of measuring graduate attribute development in students, particularly in how they contribute to developing lifelong learners (Chen, Hsu, & Wu, 2009; Hager & Holland, 2006; Manathunga, Lant, & Mellick, 2007; Manathunga, Pitt, & Critchley, 2009; Seethamraju & Borman, 2009; Ya-hui & Li-yia, 2008). This area is fraught with issues. Employers believe the attributes of graduates are not sufficiently broad and generic (Manathunga, et al., 2007) and that universities focus on lower level attributes that are easier to develop (Barrie, 2006), ignoring skills that enable students to build their careers (Bridgstock, 2009; Johnston & Watson, 2004), even though well-developed graduate attributes enhance student employability (Anonymous, 2009; de Janasz & Forret, 2008; Hager & Holland, 2006; Hager, et al., 2002; Ya-hui & Li-yia, 2008). Although there is ongoing debate about graduate attributes, it is recognised that students value more highly graduate attributes they have developed themselves (Wood & Smith, 2007), which would appear to create a justification for introducing students to word clouds. Technologically, they are a low level skill but since students must have a critical

understanding of an area in order to select the appropriate level of detail for their word cloud, the creation process involves higher level thinking skills.

IV. Student Response to Word Clouds.

In this section, student comments have been used that most accurately summarize discussions or which appeared to have general support from the other students. Students were also encouraged to submit comments by email or anonymously via a note or through another staff member, but preferred to participate in the open forum of the focus groups. Whether this preference was linked to their familiarity with speaking in a small group setting, due to the teaching style used, was not able to be assessed. However, it was apparent from the relaxed body language and casual tone of all focus group conversations that the students appeared comfortable speaking before their peers and the facilitator. In one group, students were asked if they wished to make a written record of any comments without the presence of the facilitator in the room and this offer was rejected.

When the students were introduced to word clouds as a learning aid, it was in the context of a challenge. Given a word cloud of a topic, students were asked whether it accurately represented the critical points of that topic. Students were keen to know how word clouds were created, so were shown how create word clouds from lecture notes provided as PowerPoints and internet sites. They were warned that word frequency did not necessarily reflect the importance of a word or concept. All students found this difficult to grasp. Later focus group feedback indicated that most students initially saw word clouds as a way to lessen the time spent engaging with materials but quickly discovered the opposite happened. They had to engage fully with the materials before creating a word cloud to ensure they could assess the quality of the word cloud and modify it as necessary. Some students felt tricked by this:

> I thought you were showing me something that would save me doing as much work, but I soon worked out that you can't do a good word cloud unless you really understand the stuff first. Now I find I'm really trying to understand what I read. I think you tricked us by giving us a fun thing to do so we'd think accounting was fun.

The student sent a follow-up email revising his opinion, saying he had "worked out that *even accounting* (his emphasis) is fun. Doing the word clouds helped make it fun".

Many barriers prevent students from using technology (Keengwe, Onchwari, & Wachira, 2008). To minimise barriers, time was spent ensuring students could create the word clouds quickly and felt confident technologically. No student reported difficulty creating word clouds or understanding the concept of a word cloud. Many (49 students) commented that the time devoted to teaching them how to prepare word clouds increased their enthusiasm for accounting by turning their learning into a game and a challenge. This was important feedback because in taking time to ensure all students could create word clouds easily, time had been taken that would otherwise have been used to teach additional accounting content. The feedback helped dissipate staff resentment about this use of time.

The majority of students (57) regularly used word clouds to summarise lecture notes, as had been demonstrated to them. Of the 12 students who did not regularly use word clouds to summarise lecture notes, four admitted that despite good intentions, their enthusiasm for all subjects had ebbed as the semester progressed and this regularly happened to them. They saw value in word clouds as a learning tool but were reactive not proactive learners, only putting in the bare minimum to pass each subject. The remaining eight students prepared word clouds except when assignments were due. These students acknowledged chronic time management problems. None of them achieved higher than a pass grade. This is not to

suggest that students who prepare word clouds achieve higher grades than those who did not, but rather that students whose study habits are disorganised or who fail to engage fully with their learning tend to receive lower grades than more motivated and engaged students, as would be expected.

A. Learning Styles.

A peer learning group comprising four mature age students used word clouds to summarise assigned readings and additional readings they found on the internet and in library databases. They would individually create word clouds, refining them until they felt their word clouds best expressed the most important aspects of the content, then exchange them and discuss differences among their individual word clouds. This level of proactive extension of the use of word clouds might reflect their maturity compared with the other students. They thought it reflected their work ethic, learned in the workplace and applied to their studies. Each of these students had thought about other ways that word clouds could enhance their learning. It had been a minimum of thirteen years since any of these students had engaged in formal study. One student commented that she felt a need "to do more, to hold my own with the younger ones", to quote her. These students all achieved high distinction or distinction grades (total marks of 75/100 or higher) for accounting and included the students who received the top two marks for the subject. All students in this group were accommodators.

Accommodators prefer to build on their experiences. Only accommodators commented that the workplace relevance of accounting became more apparent to them as they created their word clouds but their understanding of accounting as a discipline was primarily enhanced through their small group discussions which were based around their word cloud pictures. They referred to group learning synergies and were in agreement that collaborative approaches were more beneficial than competitive approaches. These students occasionally worked in self-selected pairs to prepare the word clouds that formed the basis of group discussions. They were strong advocates of the benefits of both collaborative and peer learning, viewing word clouds as a tool that facilitated collaborative learning and peer learning. Assimilators commented that they had assumed that when word clouds were introduced in class, there was an expectation that students would use the tool in other ways.

Although other accommodators in the class did not use word clouds as effectively as the four mature age students, all accommodators regularly explored additional uses for word clouds, making word clouds of additional learning resources or using word clouds to summarize lecture PowerPoints in other subjects. All accommodators used word clouds to build on their learning in some way, including assessing whether additional material seemed worth reading. These students spent considerable time altering their word clouds until they were happy that they accurately reflected the source material and they did not view this time as wasted.

Assimilators made word clouds of lecture notes and, in some cases, assigned readings. None of them made word clouds of additional electronic resources. All stated that they only did what was shown to them in class because "the lecturer knew best" so they did not see a need to go to additional resources. The assimilators spent considerable time tweaking the word clouds, particularly those of lecture materials, until they felt the word clouds reflected their understanding of the key lecture points. Although they brought their word clouds to group discussions, they rarely showed them with other group members, describing them as "personal" or "private" study aids. These students did not enjoy working in groups and were much more comfortable working alone. All viewed their lecturer as their primary knowledge source, even though this was contrary to the teaching philosophy in accounting and explained to all students. For assimilators, word clouds were primarily a tool

for individual reflection, and the process of tweaking their word clouds was the time when that reflection occurred. However they complained about the time they spent tweaking their word clouds, feeling that other traditional hand-written dot point summaries were faster to compile. These were the only students who did not refer to their word clouds at the end of the semester as part of their final examination revision.

Convergers liked to make word clouds of any assigned materials. Those who used word clouds to summarize material they had found agreed that this had assisted their learning. They enjoyed the time spent tweaking the word clouds, expressing very strongly that this time was not wasted. Convergers were vocal about the importance of tweaking their word clouds because they saw it as time spent in reflection. In particular, they enjoyed being able to use computers for this process. This is consistent with research indicating that convergers have a preference for computer mediated material (Buch & Bartley, 2002).

Divergers were particularly sceptical about the convergers' comments. As with the assimilators, the divergers used word clouds in subjects other than accounting. They rarely altered their initial word cloud but did spend time thinking about whether the completed word cloud represented key aspects of a topic. This contrasted markedly with convergers who reflected while tweaking their word clouds but rarely reflected on the content of the word clouds once they had completed them to their satisfaction. Convergers made judgments about the usefulness of word clouds as a learning technique the first time they created their own word cloud. They saw time altering a word cloud as time wasted. . As one student explained:

> While you are working on your word cloud and how you want it to look, you are constantly reviewing the material (summarized in the word cloud) in your mind. You go over and over it and then it starts to sink in more, and you start making links to other things you have studied and it all starts to make sense. After the group meets, you start thinking about what to change based on what they have said but why waste time altering the word cloud when you have sorted out in your mind what is right or wrong with it?

Students with the learning styles of converger and accommodator prefer to learn by active experimentation. Consistent with this, these students tended to talk more about the process of formatting their word cloud rather than the content of the material in it. This comment from an accommodator is typical:

> The best part was playing round with my word cloud. As I altered the words in it and kept changing their colours and fonts and how my word cloud looked, the words seemed to lodge in my brain, so by the time I had my word cloud the way I wanted it, I felt really confident that I understood the topic.

Divergers and assimilators viewed the process of creating word clouds as inseparable from understanding them. Table 1 summarises student approaches to using word clouds based on learning style preference.

Table 1. Pattern of word cloud use. Regular users are defined as those using word clouds for at least 10 weeks of a 13 week semester.

Learning Style Preference	Number of students working in groups with students with similar preferences	Number of students working in groups with students with dissimilar preferences	Regularly used word clouds as demonstrated in class	Regularly used word clouds in way(s) beyond those demonstrated in class
Accommodaters	15	8	23	23
Assimilators	13	2	12	0
Convergers	16	4	15	8
Divergers	6	5	11	10

B. Teaching Approach.

All students commented positively on the small group teaching approach and the usefulness of their word clouds as a basis for their contribution to small group discussions. In some groups, one student took responsibility for preparing word clouds rest of the group; other members took on other tasks on behalf of the group. The level of trust students had with word clouds prepared by other students was connected to their perception of the student who prepared the word cloud for the group. To quote two opposing views of students:

> (He) is the brightest student in my tute so I knew the word clouds would be great.

> The person who prepared our word clouds is really good at IT but not so good at accounting, so I guess the word clouds were OK but I would have preferred (student name deleted) to have done them because she's good at accounting.

The first comment was made by someone with a strong preference for an assimilating learning style. Just as assimilators tend to enjoy lectures and respect lecturers for their deeper knowledge of a subject, this student was happy to defer to the assumed deeper knowledge of another student. The second comment was also made by an assimilator, but one with a learning style preference that bordered on the diverger style. Divergers tend to be reflective and so it is not unexpected that this student would have thought about who might be the best person to prepare the word clouds for their group.

All students enjoyed being part of a learning group, even when members of the group had different learning styles. However, not all group members understood the learning benefits of collaboration, viewing it primarily as means of dividing labour in a subject rather than a way to reinforce learning and construct meaning in a group environment:

> The others in my group helped me with lots of things. I found accounting really hard … the hardest thing I've ever studied. But I'm good at IT so I did words clouds for us. It all evens out in the end. This was a way I could pay people back … do something for the group. I had to do my share.

C. Student ownership of learning techniques.

All students agreed that being able to customize word clouds increased their sense of ownership of their learning. As one student commented:

> It was mine … just all mine. Mostly at university, you are doing what everyone else does but trying to do it better so you get a high mark but I put time into making my word cloud special because it made me feel different … unique, I mean … individual. Because I played with getting it to look just how I wanted it to look, I had to work out which words mattered and why so I learned stuff without trying in the process.

D. Developing workplace skills.

Students unanimously agreed that word clouds were a useful workplace tool for summarizing information in addition to being a useful learning tool for present studies, although most regretted learning about word clouds so late in their degree. One student's comment encapsulates the general view:

> In philosophy we learnt that knowledge is power. Well, knowledge means having information and these days, most of it is easy to get because it is all on the internet. But who has time to read it all? I know that I can use word clouds to help me filter out what I'd be wasting my time on.

Over half of the students felt that they could not use word clouds in another subject unless the lecturer of that subject expressly encouraged it, even though they appreciated the benefits of word clouds as a learning tool. This attitude was troubling as it suggests many students are reluctant to be proactive learners unless they feel they have been given permission to go beyond perceived learning boundaries in a subject. The prevalence of such an attitude is outside the scope of this research but may be an important area for future research as it is important for all teachers to understand how their students approach learning.

The limitations of word clouds as a workplace tool were discussed. Students were reminded that word clouds tabulated word frequency, which could led to key points being missed. Despite this, all saw value in word clouds as a workplace information management tool. These comments summarize general feeling:

> But even if I read everything, I might miss some key point. In business, you can't sit all day looking on the internet in case there's some new thing you should know. Word clouds allow me to sift through a lot more information than I otherwise could if I had to read it all.
>
> In every subject I've studied, I've been told that I'm developing graduate attributes and I've never really understood what they are or what it is that I actually developed that I couldn't do before. Finally, I feel like I have developed a useful attribute. Word clouds have given me a tool that will let me get up to speed with any sudden changes, and change can happen really quickly, like when the global financial crisis happened. This has been the most useful graduate attribute I've developed and the university doesn't even call it one.

When asked to define the graduate attribute developed through creating and using word clouds, student responses were mixed. The most frequent descriptions were the ability to stay on top of relevant information (20 students) or manage it (39 students). Three students took a broader view, describing it as an aspect of change management or simply part of being a good manager. Seven students felt unable to name the attribute but agreed that they had learned a skill they could apply in the workplace. After much discussion, one of the more reflective students stated:

> Word clouds have empowered me so I feel I can take charge of my own learning. These days, to succeed in business, you need to be able to do that. I think the graduate attribute is being a workplace learner, not just a university learner.

This comment was well-received by other students. This student had grasped the concept of life-long learning without naming it as such. Research indicates the benefits of lifelong learning (Bath & Smith, 2009; Bauer & Gruber, 2007; Chen, et al., 2009; Hager, et al., 2002). The importance of developing students with an attitude that learning is a lifelong process has been officially recognised in Japan and by the European Union (Ogawa, 2009). Students considered the 2008 global financial crisis a critical event that highlighted the importance of business managers having through and complete knowledge and an ongoing ability to learn but added that word clouds were only a useful tool if managers already had the knowledge and experience to evaluate their usefulness.

V. Discussion.

A. Learning Styles.

The strong correlation between learning style preferences and the use of word clouds was unexpected. Since the students knew their own learning style preferences, had this conditioned them to use word clouds in ways that meshed with those activities? Although the students disagreed, it was difficult to accept that the alignment could be so clear-cut, particularly when many of the students were close to the divide between their learning style

preference and another learning style preference. If this suspicion is correct, it suggests that students might have subconsciously eliminated uses of word clouds that they considered inconsistent with their learning style preferences. However, since the student response to word clouds was strongly positive, perhaps what matters is that word clouds proved a valuable learning aid. Student feedback indicated that word clouds increased their motivation in accounting, giving them a sense of ownership of the discipline content because they could alter how it was presented.

B. Teaching approach.

All students participated in small learning groups to enhance peer learning. Students were encouraged to form their own groups. Although most students had settled into groups of students with similar learning style preferences, they viewed this as random assignment because they had not expressly discussed learning style preferences with other students before making their group selection. It is difficult to see it as completely because students had been encouraged to form groups where members had similar attitudes to and expectations about learning, plus similar study habits and these students had known. Groups whose members had mixed learning style preferences commented that there was considerable conflict about the use of word clouds; in one group, this remained unresolved. In the other group whose members had different learning style preferences, the views of the most dominant and vocal person were followed. Other members of the group expressed varying degrees of dissatisfaction about that outcome. They also expressed dissatisfaction concerning any discussions based around their word clouds, feeling that the vocal person set the parameters for these discussions and only his word clouds were used for discussion. Nevertheless, they all saw value in using word clouds to enhance learning.

Groups whose members had similar learning style preferences appeared more harmonious, with one exception. Since that conflict was about a member who regularly disengaged with his team-mates, it was not connected to the use of word clouds.

All students agreed that being part of a small group that met weekly had provided an impetus for preparing their word clouds because there was an expectation that members of a group would bring their completed word cloud to meetings. They could see the alignment between the constructivist approach to teaching and the introduction of word clouds as a learning technique.

C. Student ownership of learning techniques.

As with all aspects of student learning, there will always be some students who are not sufficiently motivated to engage fully with it. This research and the teaching approach used in accounting assumed most students want to engage in deep learning but do not always know how. Word clouds gave students a tool that assisted them to more fully engage with accounting. They provided a process for learning.

Students were adamant about three points. First, learning a *process*, such as word clouds, could engage them in a subject almost as much as engaging content could. Second, unless they could see workplace relevance of either content or a learning tool presented to them, students had less incentive to engage in deep learning, irrespective of the stated learning outcomes or lecturer's expectations. Third, there were two key drivers in student uptake of word clouds: being able to individualize it, whether by customizing the look of the word cloud or by using it for the purposes they chose, and the small group teaching approach, where they either had an opportunity to show their word cloud art for others to admire or where they could use their word cloud to aid their participation in discussions. Students were

also adamant that being able to create a unique word cloud gave them a sense of ownership of the word cloud *and the associated learning*. These results raise some important teaching related issues about the relevance for learning of teaching processes versus teaching content, the extent to which workplace relevance should impact on *how* we teach as opposed to what we teach, how we support students to feel they are unique while trying to teach a group of students and the role of teaching *process* in assisting students to take responsible ownership of their learning. How these issues are addressed will depend on the student demographic.

Students commented that being able to choose how to use word clouds to enhance their learning increased motivation to understand accounting and enhanced their sense of self as they were able to take ownership of the learning process. A developed sense of self appears to be a quality valued by employers (Walther & Radcliffe, 2007). It is paradoxical that a computer mediated processes appears to enhance something as personal as one's sense of self. Whether this is reflective of the age range of the students, the majority of whom "grew up with computers", is not known but it would be interesting to know the extent to which the sense of self of such students might in some way link to technology.

D. Developing Workplace Skills.

Perhaps it was because the students were due to graduate that they were particularly concerned to acquire skills transferable to the workplace so they were predisposed to view word clouds as a skill transferable to the workplace. The students described the knowledge base required for business management as fragmented, eclectic and constantly changing, and thought word clouds were ideally suited to give them some way of managing such information and the plethora of information available to them electronically. In that regard, word clouds met the purpose for which they had been introduced to the students.

The trade-off between giving accounting students competence in current accounting practices versus equipping them for the longer term is always problematic. In accounting, this trade-off tends to be viewed in terms of the discipline content taught, whereas this research suggests it should expand to include learning processes.

VI. Conclusion.

This research describes an attempt to meet student concerns about managing the quantity of information to which they would be exposed in the workplace. It explores the introduction of word clouds as a tool that would assist the students to summarize electronically available information in the workplace. It also explores word clouds as a tool to assist student learning.

The lack of a base of prior work on student use of word clouds to enhance learning necessitates this research being exploratory. This research indicates that students enjoy using word clouds and find them easy to use but more importantly, that word clouds have potential as a learning tool. Word clouds provide some flexibility both in design and in use. This research shows how a group of final year students took advantage of the flexibility in way's consistent with their learning style preferences. This gave them a sense of ownership of their studies, enhancing their motivation and engagement with their learning.

This research suggests that word clouds provide a useful adjunct to other learning strategies bit must be used with caution as they summarize word frequency and this may not align with word relevance.

There are always dangers in generalising from one small case study. This study involved a relatively small group of students and a relatively short time frame. However, the strongly favourable response by students to word clouds and flexibility of word clouds

suggest that this technique is worthy of inclusion as a teaching tool and that their use by students is worthy of further research.

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