

# **CONCEPT MAPPING - EXPLORING ITS VALUE AS A MEANINGFUL LEARNING TOOL IN ACCOUNTING EDUCATION**

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## **ABSTRACT**

This paper provides a framework for using concept mapping for meaningful learning in accounting education. It includes a review of the extant literature on the effectiveness of concept mapping, an inventory of ready-to-use concept maps for introductory accounting, and a step-by-step guide to introduce concept mapping in the classroom. In addition, a limited research study on learning outcomes is discussed as well as constraints in using this pedagogical approach.

Concept mapping is widely used in other disciplines as an enriching learning tool to help students organize information and develop higher-order thinking skills. It involves a process of externalizing, through drawing and diagrams, the mental connections and association patterns that a student makes on knowledge learned (Angelo and Cross, 1993). It is an innovative classroom pedagogy that promotes development of self-learning and life-long learning skills sought by the early change agents in our profession, validated more recently in the joint AAA, AICPA, IMA report (Albrecht and Sack, 2000).

**Key words:** Concept mapping, meaningful learning, higher order thinking, introductory accounting, life long learning, and innovative pedagogy

## INTRODUCTION

The accounting profession has generated a litany of calls demanding that accounting education change the content covered, teaching methods used, pedagogies employed, and explicitly develop professional competencies and skills (AAA, 1986; Perspectives, 1989; AECC, 1990; Kimmel, 1995; Porter and Carr, 1999; AICPA, 2000a; AICPA, 2000b; Demski and Zimmerman, 2000; Albrecht and Sack, 2000). In 1995, Kimmel observed, “traditional accounting programs emphasize algorithmic exercises and focuses excessively on development of rote knowledge” (p. 299). Albrecht and Sack (2000) described this as a “perilous” state of accounting education, observing that educators do not promote meaningful learning in the classroom and have failed to develop students’ thinking skills. Even the AACSB, the premier business school and accounting program accreditation body, revised its standards by emphasizing mission-based strategic planning and recognized the need for continuous curriculum improvements to meet the needs of the profession. Clearly, as accounting educators, we must take these charges and concerns seriously. Concept mapping, an approach discussed in this paper, is one way to implement a classroom pedagogy that promotes meaningful learning and also helps develop students’ thinking skills.

### What is Concept Mapping?

Concept mapping is an innovative classroom tool and technique that can deepen our curricula as students advance through an accounting program. It is an enabling skill to enhance the development of students’ thinking skills through more meaningful learning activities. By “enabling” we mean that the skill, once learned, can help students to organize what they know and think in more complex ways.

Concept maps are drawings or diagrams that show the mental connections and association patterns a student makes on knowledge learned (Angelo and Cross, 1993). In its simplest form, a concept map is only two concepts connected by a linking word (Novak and Gowin, 1984). For example, “accounting requires complex thinking” represents a simple map forming a valid statement about the concepts “accounting” and “complex thinking.” The art of externalizing knowledge, through drawings or diagrams in the form of concept maps, is called concept mapping. Figure 1 illustrates this simple concept map.

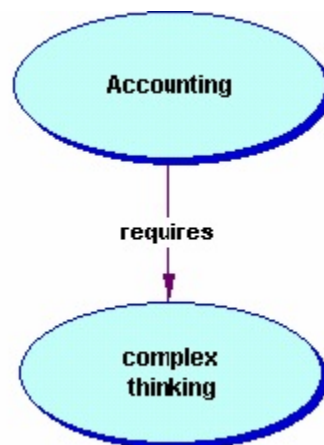
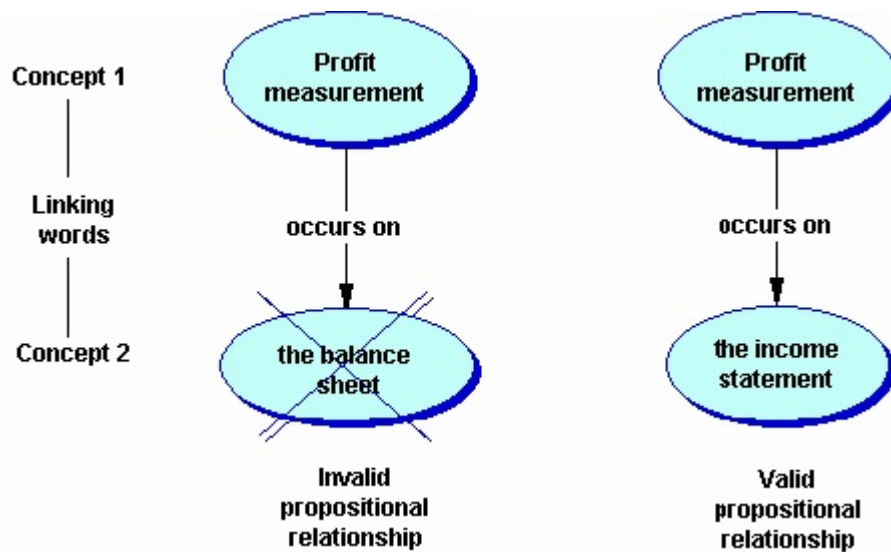


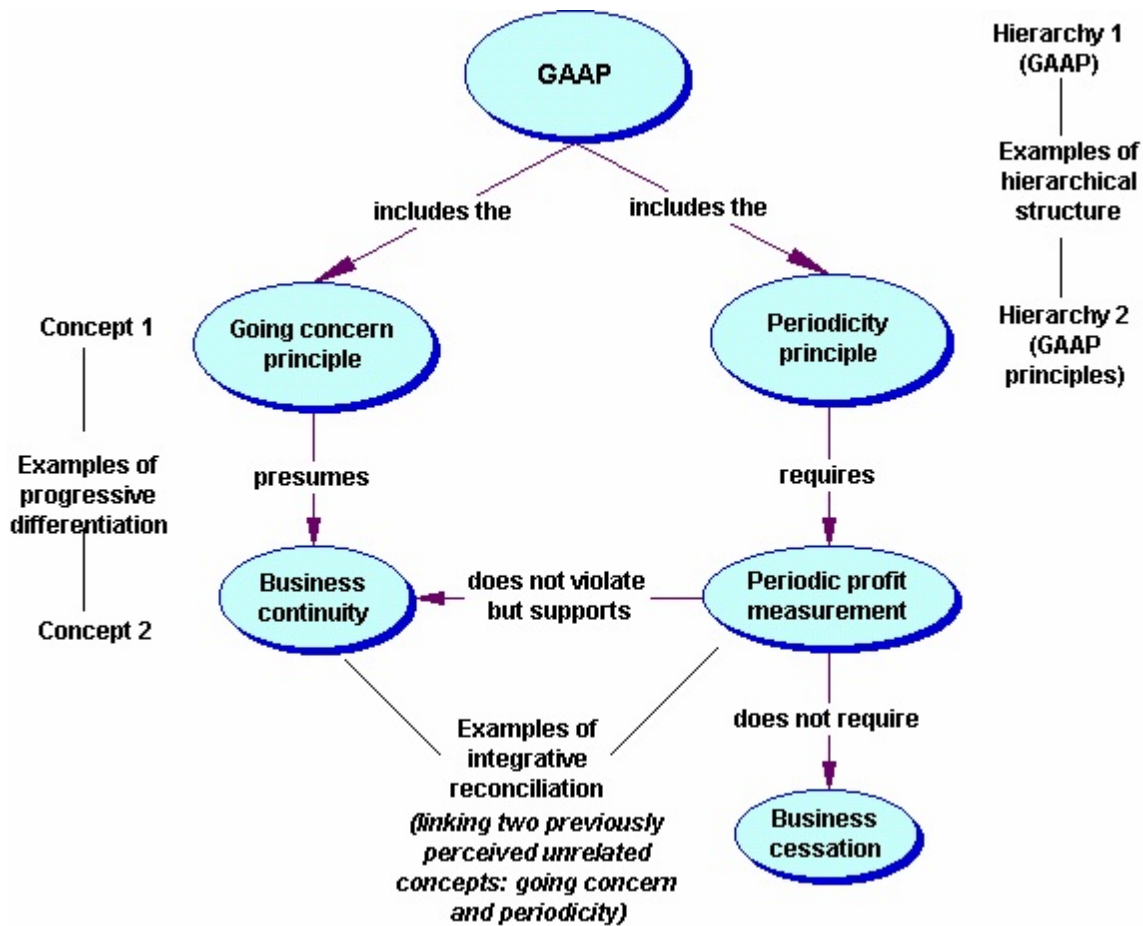
Figure 1. Illustration of a simple concept map.

Key components of concept maps are the propositional relationships or links, two or more concept labels linked by words that read as a unit. The links are usually action words explaining the meaning of the relationship. In the early stages of developing this skill, links may be less important than basic concept identification. In Figure 1, the linking word “requires” connects the concepts “accounting” and “complex thinking” in a meaningful proposition unit. Validity of the relationship is also important. Figure 2 illustrates an invalid propositional unit (profit measurement occurs on the balance sheet) and a valid propositional unit (profit measurement occurs on the income statement).



**Figure 2. Illustration of an invalid and valid propositional relationship.**

The underlying learning theory of a concept map is the symbolic representation of how students process information and organize knowledge in their cognitive (thinking) domain. In simple terms, the elements of a concept map relate to how cognitive knowledge is developed structurally by a learner: hierarchical structure, progressive differentiation, and integrative reconciliation (Ausubel, 1963; 1968; Novak and Gowin, 1984). These sophisticated learning theories can be simply described and illustrated in the context of accounting knowledge. Hierarchical structure means a learner recognizes knowledge as part of an inclusive framework. In Figure 3, Generally Accepted Accounting Principles (GAAP) is a knowledge framework (hierarchy 1). The periodicity and going concern assumptions fit into the hierarchy of GAAP but also represents a framework (hierarchy 2) in and of themselves. Progressive differentiation means a learner develops more ideas and concepts as knowledge deepens. In Figure 3, adding GAAP principles under the hierarchy of GAAP, as well as adding attributes of the going concern principle or periodicity principle, illustrate progressive differentiation. Integrative reconciliation means a learner perceives interrelationships, such as perceiving the relationship between two or more GAAP principles. In Figure 3, when a learner recognize that there is a relationship between going concern and periodicity by drawing the horizontal link (“does not violate but supports”), the learner is illustrating the idea of integrative reconciliation.



**Figure 3. Illustration of the underlying learning theory of a concept map as it applies to accounting.**

Like most disciplines, effective use of accounting knowledge is based on a thorough understanding of an integrated conceptual and technical business framework. In an educational context, this means students apply the knowledge and skills acquired in introductory courses to new knowledge and contexts in other discipline-related or upper-level courses during their formal education. For example, a student must be able to determine accounting cash flows to project the cash effects of business transactions in a finance class. In a professional context, accounting graduates must be capable of applying conceptual and technical business knowledge and skills to structured, unstructured, or ill-defined business scenarios. To be an effective advisor, graduates must be capable of perceiving and projecting the transactional effects on a company's financial or cash position and also develop these perceptions in creative and innovative ways.

Often students are limited in developing their ability to think in more meaningful or creative ways. They are often inexperienced in how to relate new concepts and ideas to previous knowledge. This pattern worsens over time. Students become less capable to learn and apply more complex knowledge and concepts when their current knowledge frameworks are weak and unorganized, a phenomenon not unique to accounting education. Novak (1998, p. 24) observed:

The more we learn and organize knowledge in a given domain, the easier it is to acquire and use new knowledge in that domain. The curse is that when we try to learn new knowledge in a domain where we know little, and/or what we know is poorly organized, meaningful learning is difficult, usually time consuming and tiring. Too often, we may escape the challenge by resorting to rote learning, even though we know that what we learn will soon be forgotten and it will not be of value in future learning.

Novak's observations seem common knowledge among us as accounting educators. Indeed, these issues have been at the heart of concern to the accounting profession over the last two decades. If we are committed to include meaningful learning activities to help develop students' thinking skills as educators, then we must seriously consider concept mapping as a viable classroom-learning tool.

The research findings and implications for accounting educators are discussed in the next section of the paper. Following the research findings and implications are ideas for integrating concept mapping in the accounting classroom. This latter section offers ready-to-use maps, a step-by-step discussion of how to introduce concept mapping to students, possible learning outcomes based on a preliminary research study, and constraints. The paper concludes with a summary of the benefits of concept mapping and the call for further research to transfer those benefits to accounting education.

### **RESEARCH FINDINGS AND IMPLICATIONS FOR ACCOUNTING EDUCATION**

In this section, the major research findings are documented from a variety of disciplines. In addition, the relevant implications of these findings are linked to accounting education.

#### **Research Findings**

The idea of "concept mapping" was first introduced by Joseph Novak to enhance concept learning in science education. Ausubel's assimilation learning theory (1963; 1968), mentioned briefly in our introduction, heavily influenced Novak's work and provided the learning theory from which concept mapping was born. In perhaps the most classic concept mapping research published, Novak and Gowin (1984) defined concept mapping as an educational tool developed "specifically to tap into a learner's cognitive structure and to externalize, for both the learner and the teacher to see, what the learner already knows" (p. 40). This research focused on using concept mapping to enable learners to acquire their own meaning of science concepts (analogous to basic accounting concepts), finding that concept maps were remarkably revealing of students' perceived knowledge.

We now see that concept maps can play a role in teaching, learning, curriculum, and governance. For the learner, they help to make evident the key concepts and propositions to be learned, and also suggest, linkages between the new knowledge and that which he or she already knows. For the teacher, concept maps can be used to determine pathways for organizing meanings and for negotiating meanings with students, as well as to point out students' misconceptions. In curriculum planning and organization, concept maps are useful for separating significant from trivial information and for choosing examples. With respect to governance, concept maps

may help students understand their role as learners; they also clarify the teacher's role and create a learning atmosphere of mutual respect... (pp. 22-23)

Over time, the effective use and versatility of concept mapping has been further documented in a wide range of disciplines (e.g., art, history, literature, marketing, math, music, religion, biology, ecology, social sciences, and sports). As such, our discussion of the existing research focuses on the following five themes: (1) to understand what students know and help them organize and build frameworks of knowledge, (2) to build bridges and promote students' thinking about relationships between concepts and ideas, (3) to tackle more complex tasks and promote development of higher-order thinking skills, (4) to integrate effective pedagogical tools to promote meaningful learning, and (5) to promote competency in using computer-based visual learning tools.

Concept mapping helps educators understand what students know by the process of externalizing this knowledge; it provides an observable and assessable record of the student's conceptual schemata and starting knowledge points (Angelo and Cross, 1993). This is the foundation of Novak and Gowin's (1984) initial work and a strong common thread through the related literature. It also helps students organize information and build better frameworks of knowledge, which is critical as new knowledge is acquired. Concept mapping is a visual learning tool that corresponds to thinking processes, allowing students to organize ideas and read, write, and think better. It also provides a technique to organize knowledge into a progressively more complex conceptual framework (Hyerle, 1996; Jonassen, et al., 1997).

Concept mapping supports the idea of building better frameworks of knowledge by enhancing the relationship-building between concepts and ideas. It serves as a pedagogical device to encourage learners to visualize interrelationships, to identify misconceptions, and to build bridges between two concepts or ideas (Cross and Steadman, 1996); a powerful learning strategy to force a learner to think actively about the relationship between terms (Dorough and Rye, 1997). Its use in post-secondary education emerges in this theme, illustrating its effectiveness in bridging the gap for students between critical ideas of information as an object and information as sense-making (Todd and Kirk, 1995). This illustration is analogous to accounting as information and a decision-making tool in our own discipline. Post-secondary data developed by Schau and Mattern (1997) found statistically significant increases in perceived accuracy of introductory statistical concepts by continually using mapping techniques. "Students who have 'isolated' information about various statistical concepts, but do not understand how these concepts are interrelated (and differentiated), remain novices. Connected understanding is a prerequisite for effective and efficient statistical reasoning and problem-solving" (p. 171). Leuby and Brazina (1998) first introduced concept mapping in teaching college level introductory accounting. This work showed limited results suggesting potential effectiveness of concept mapping, and also called for controlled empirical studies to validate their initial findings. However, none have been published since their proposal.

Using empirical methods, Jegede, Alaiyemola and Okebukola (1990) validated the usefulness of concept mapping activities not only as a way to enhance bridge building in 10<sup>th</sup> grade biology classes to improve achievement, but to also reduce anxiety in learning. Thus, this study draws in a very important idea that concept mapping might be effective not only in the more familiar cognitive domain [as set forth in Bloom's Taxonomy (1956)] but also in the less often discussed but equally important affective domain [as described by Krathwohl, Bloom and Masia (1964)]. Affective behaviors include such non-cognitive but important learning behaviors as receiving,

willingness to receive, responding, and willingness to respond. Stimulated positive affective behavioral attributes can promote more meaningful learning.

The dependent variables in the Jegede, Alaiyemola and Okebukola (1990) study were achievement and anxiety. Achievement was measured by a 50-item multiple-choice instrument previously validated and anxiety was measured by the Zuckerman's Affect Adjective Checklist, which asks students to describe how they feel about learning science, i.e. biology in this case). The results of a control group (n = 29) exposed to traditional instructional methods for biology were compared to the results of an experimental group (n = 22) on the same instruments, but after the experimental group had been exposed to concept mapping as the primary instructional strategy. T-tests carried out on the pretest data for both achievement and anxiety showed no significant difference, leading to the conclusion that the control and experimental groups had equivalent entry behaviors on the variables, However, using a 2 X 2 analysis of variance on the post-test score, a significant difference was observed, leading the authors to conclude that concept mapping led to a significantly greater reduction in anxiety level of students (which in turn led to improved achievement). While limited, this study adds an interesting new perspective on the value of concept mapping.

As students acquire more sophisticated sets of knowledge and skills, expectations demand that they demonstrate an ability to successfully think through and apply their knowledge and skills to more difficult situations. The literature demonstrates that concept mapping provides a framework to develop a student's structural knowledge in a domain that, in turn, promotes development of higher order thinking skills essential for complex learning tasks (Jonassen, et al., 1993; Jonassen, 1996). "Structure is inherent in all knowledge, so understanding the structural foundation of any content domain improves comprehension...structural knowledge is essential to problem-solving" (Jonassen, 2000. p. 61). This tool has also proved effective in small group tasks to help students resolve more complex assignments (Angelo and Cross, 1993).

Under the theme that concept mapping is effective to tackle more complex tasks and promote development of higher-order thinking skills, there have been some additional observations and empirical findings. Peresich, Meadows and Sinatra (1990) discuss somewhat astonishing results that point to the effectiveness of using concept mapping across a curriculum and across disciplines as the primary instructional strategy to improve students' level of comprehension in basic state-mandated reading skills assessments tests. In this study, 11<sup>th</sup> grade student test scores using traditional instruction and concept mapping instruction were observed and compared. Reading comprehension improved from 77.0% to a 99.2% pass rate, an improvement of 22.2%; written communication improved from 85% to a 97.5% pass rate, an improvement of 12.5%; theme writing improved from 47% to a 100% pass rate, an improvement of 53%. Particularly noteworthy about this line of research is the authors' observations that concept mapping activities significantly improved students ability to think and work at the three highest domains in Bloom's (1956) taxonomy (analysis, synthesis, and evaluation), where higher-order thinking occurs.

Beissner (1992) followed this theme using empirical methods, validating the effectiveness of using concept mapping to promote higher-order problem-solving skills in 52 physical therapy and 8 athletic training college majors. In this study, regression analysis was used to compare the results on a problem-solving test (dependent variable) given to a control group and an experimental group. A control group (n = 29) studied a 2,000-word text passage using traditional methods while an experimental group (n = 29) studied the same text passage by drawing concept maps. Regression analysis showed that there was a significant difference in the problem-solving ability of the

experimental group as compared to the control group. While limited, this study adds further support suggesting that concept mapping may be an effective means of improving students' problem-solving ability, an educational outcome highly desired in accounting education

The classroom is a multi-dimensional environment; students learn in different ways and different approaches must be used to help students learn. An important segment of the literature demonstrates how concept mapping can be an effective pedagogical tool to support different types of classroom tasks designed to promote learning: to illustrate major ideas or units during a semester (Novak and Gowin, 1984), to extract meaning from assigned textbook or other readings (Novak and Gowin, 1984; Jonassen, 1996), to plan a paper or essay (Novak and Gowin, 1984; Angelo and Cross, 1993), to stimulate idea-creation and brainstorming (Ditson et al., 1998), and to wrap up and synthesize a unit of instruction (Odom and Kelly, 1998). In MBA programs, concept mapping fundamentals formed the key process by which students synthesized key ideas and lessons learned from course material (Mento et al., 1999; Mento and Jones, 1999).

The last line of research demonstrates the usefulness of concept mapping in a computer-based environment. "The mechanics of drawing a concept map often get in the way of ideas students want to represent. Modern visual outlines [such as visual learning tool technologies] take the eraser dust out of concept mapping" (Anderson-Inman and Zeitz, 1993, emphasis supplied, p. 6). Anderson-Inman and Horney (1997) observed the growing popularity of computer-based concept mapping:

Concept mapping in an electronic environment facilitates the visual thinking that underlies this form of knowledge representation, making it more accessible and less frustrating. In the same way that word processing has revolutionized writing and writing instruction, computer-based concept mapping is revolutionizing this important form of visual expression and literacy enhancement. Using a computer to create a concept map encourages revisions to correct errors as well as alterations to reflect changes in thinking over time. The electronic medium is flexible and forgiving. (p. 302)

Jonassen is a noteworthy contributor in the area of computer-based semantic networking tools. This contribution to the literature validates concept mapping as a cognitive learning tool to promote higher-order thinking. In addition, it demonstrates how concept mapping and information technology can be combined to create a powerful tool for meaningful learning in the classroom:

Semantic networking is the process of constructing...concept maps – of identifying important concepts, arranging those concepts spatially, identifying relationships among those concepts, and labeling the nature of the semantic relationship among those concepts. These maps are used by learners to represent what they know or are learning as multidimensional networks of concepts...semantic networking programs [engage]...learners in critical thinking by engaging them in organizing the underlying ideas in the content being studied...Any tool that can externalize mental ideas has to be powerful. (Jonassen, 2000. pp. 59-60)

Table 1 summarizes some of the web sites that offer visual learning tools suitable for concept mapping and available for 30-day free trials, except where noted. All of the computer-based maps

in this paper were prepared using the software Inspiration®, which is clearly the most widely used. However, there are a myriad of other equally effective classroom-based visual learning tools.

### Implications for Accounting Education

The research findings are persuasive. Concept mapping is an effective and versatile tool that enhances meaningful learning in the classroom. These findings tell us concept mapping is a well-entrenched and proven tool across a wide range of disciplines; an effective enabling skill to improve how students learn, how they interconnect what they learn, and how they develop more sophisticated thinking skills.

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**TABLE 1**  
**Web Sites That Offer Visual Learning Tool Technologies for 30-day Free Trials**

<u>Name of Software</u>	<u>Web Address</u>
Inspiration	<a href="http://www.inspiration.com">www.inspiration.com</a>
Smartdraw	<a href="http://www.smartdraw.com">www.smartdraw.com</a>
Decision Explorer	<a href="http://www.banxia.com/dexplore/demo.html">www.banxia.com/dexplore/demo.html</a>
SemNet	<a href="http://www.biologylessons.sdsu.edu/about/semnetdown.html">www.biologylessons.sdsu.edu/about/semnetdown.html</a>
Visual Mind	<a href="http://www.visual-mind.com">www.visual-mind.com</a>
MindManager X5Pro	<a href="http://www.mindjet.com/US/">www.mindjet.com/US/</a> (21-day trial)
Cmap	<a href="http://cmap.ihmc.us/">http://cmap.ihmc.us/</a>
VisiMap Professional	<a href="http://www.coco.co.uk/">www.coco.co.uk/</a>
Smart Ideas	<a href="http://www2.smarttech.com/st/en-US/Products/SMART+Ideas">www2.smarttech.com/st/en-US/Products/SMART+Ideas</a>

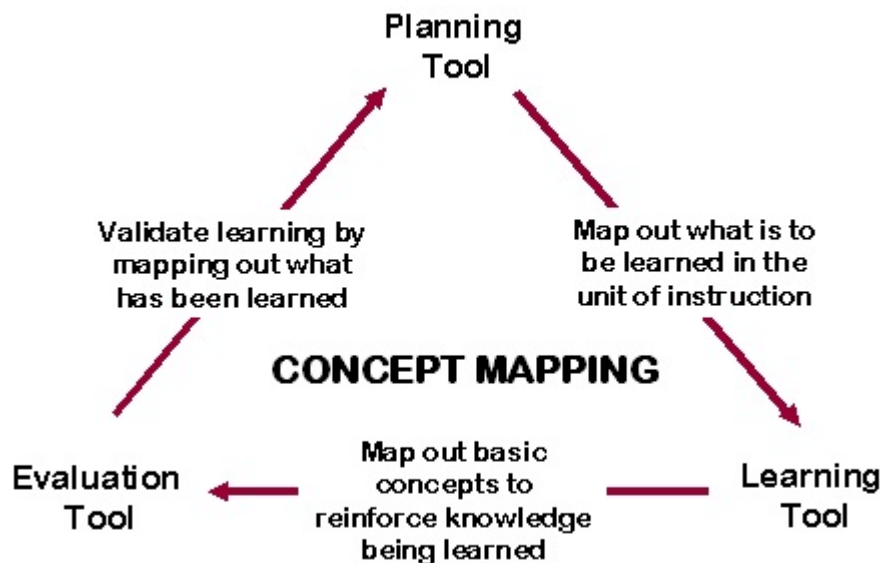
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As educators, we are challenged to change our teaching methods and to enhance the students' learning environment. Non-traditional tools, such as concept mapping, hold great promise to improve what students learn and simultaneously develop the desired thinking skill competencies demanded by the accounting profession. The underlying learning theory of concept mapping (hierarchical structure, progressive differentiation, and integrative reconciliation), coupled with its classroom versatility, provides a basic foundation to achieving the tall task we face as accounting educators. If we are committed to developing meaningful learning activities, then serious consideration should be given to introducing concept mapping as a viable classroom tool early in students' formal accounting education.

### INTEGRATING CONCEPT MAPPING ACTIVITIES IN THE ACCOUNTING CLASSROOM

This section provides an overview, drawn from research findings, of how to integrate concept mapping in the classroom. A few ready-to-use concept maps are provided as a simple way to introduce concept mapping as a learning tool in accounting. In the body of this section, a step-by-step approach is offered to successfully introduce this skill to students, since the greatest benefits of concept mapping come when students create their own maps. This step-by-step approach is based on our own experience and success in using concept mapping in group tasks in our accounting classes. In addition, this section discusses possible learning outcomes based on an experimental study as well as constraints that must be considered.

The research findings portray concept mapping as a versatile and enriching tool that can be used in different ways to achieve classroom-learning tasks. The focus of this paper is using concept mapping as a conclusion to a unit of instruction (as a learning tool); however, the tool can be used at any point in the learning process. Figure 4 depicts the three principal points where concept mapping is useful in fulfilling classroom tasks: as a planning tool (to plan instruction and provide students with a visualization of what is to be learned and how it connects), as a learning tool (to reinforce concepts learned in a unit of instruction), or as an evaluation tool (to validate learning by mapping out a perception of what has been learned).



**Figure 4. Concept Mapping Classroom Triangle.**

### **Ready-to-Use Map Inventory**

As noted earlier, while Leuby and Brazina (1998) suggested that accounting educators experiment with concept mapping, to date no empirical studies or new articles are published relating to concept mapping. The most obvious reason for this lack of experimentation is the amount of time it takes to learn the methodology, the effort to teach students how to construct concept maps, and the process to integrate the tool into courses. To jump-start the process, an inventory of twelve ready-to-use concept maps suitable for introductory accounting courses has been created. Appendix 1 describes these maps and provides ideas on using them.

Using the ready-to-use map inventory allows accounting educators to circumvent the amount of time it takes to introduce concept mapping in the classroom, eliminating the need for either faculty or students to learn the skill. The intent allows instructors to pick ready-to-use maps that meet their needs and to generate ideas for creating and experimenting with concept maps as meaningful learning tools. As suggested by Todd and Kirk (1995), introducing concept maps in introductory courses allows students to gain a skill that can be used throughout their entire college

experience and beyond. In addition, further experimentation by faculty and the development of empirical evidence to support its real benefits may result.

The goal in using any concept map is to help supplement what an instructor is already doing in a course. Students learn from various mediums and the visual impact of concept maps can greatly improve meaningful learning. While the design and content of these maps is intended for introductory accounting, the maps are also useful in other accounting courses (i.e., intermediate accounting).<sup>1</sup>

A suggested approach offers the ready-to-use maps to a class after finishing a relevant unit of study. For example, after completing a chapter on basic financial statements, students can be placed in small groups to discuss the purpose of one or more of the financial statements. One of the ready-to-use maps in the inventory could be used to elaborate and provide additional reinforcement to the students' learning process. As an illustration, after a discussion of the statement of cash flows, Map 4 ([Click here to open](#)) can summarize and wrap up a discussion of the three principal components of the statement (operating, investing, and financing). Students could be encouraged or assigned the task of developing other valid concepts or examples that add breadth and scope to the map. By using the map as the focal point of discussion, students learn how to organize their knowledge into useful frameworks supported by the underlying learning theory of concept mapping: hierarchy, progressive differentiation, and integrative reconciliation.

Figure 5 illustrates one method of applying the underlying learning theory to Map 4. There are two primary hierarchies (meaning the information therein is part of some inclusive framework) illustrated in this map: Hierarchy 1 is the main idea of the map, or the statement of cash flow; Hierarchy 2 is represented by the individual cash flow components (marked A, B, and C: operating, investing, and financing). Progressive differentiation (as learners develop more ideas and concepts, knowledge deepens) is illustrated by the activities that define each of the individual components. As an example, progressive differentiation is illustrated by the concept example "Cash to repay notes payable (Cash outflows)," which defines and elaborates on the concept of financing activities. This particular map has nine illustrations of progressive differentiation; students could be encouraged to add more or to elaborate on the ones provided or even add additional hierarchies to expand the concepts.

The third aspect of the learning theory, integrative reconciliation (meaning that learners begin to perceive interrelationships among concepts and components not previously recognized) is not illustrated in Map 4 because of the map's purposeful simplicity. However, it could be added, making the map more complex, by engaging in a classroom discussion or assigning the students the task of examining how the statement of cash flow is related to the balance sheet and income statement, and then how each of the components (operating, investing, and financing) play a role in that interrelationship. As an alternative to creating an overly complex map, which can sometimes be overwhelming to students initially, a new map could be developed that focuses just on the interrelationships of the statement of cash flows, either as an activity guided by the instructor or by students in groups as an in-class assignment. Such a map would contain its own set of hierarchies, progressive differentiations, and integrative reconciliations. In any way the maps are used, they

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<sup>1</sup>In Watson's et. al. (2003) accounting education literature review she notes, "what is needed most in the accounting literature is empirical evidence about how to improve the educational setting" and "how to integrate technology into accounting education so as to enhance student learning" (311). Both of these objectives can be accomplished by using concept mapping in a rigorously defined experimental setting.

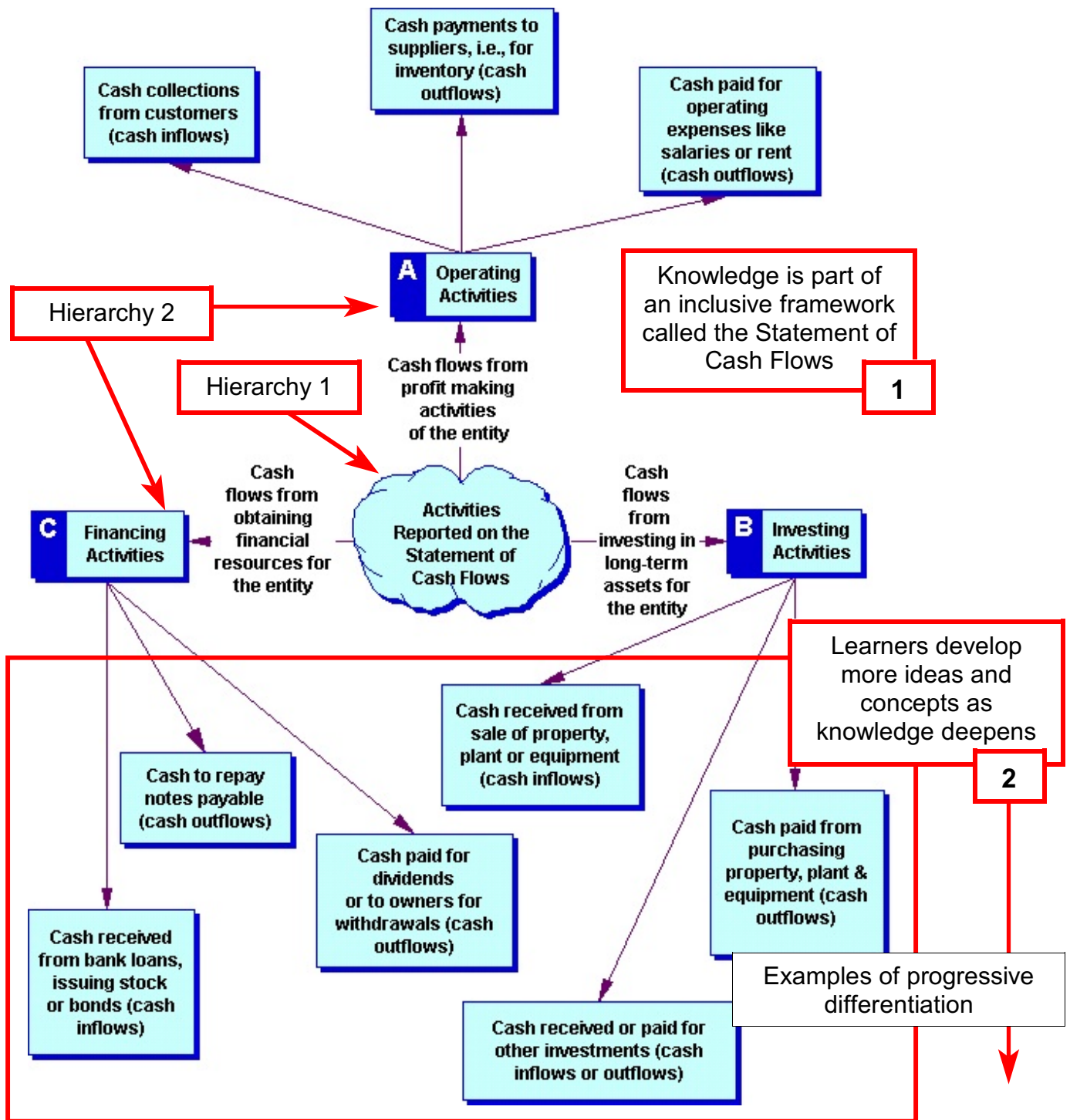


Figure 5. Underlying Learning Theory Elements: Ready-to-Use Map 4. Introducing Students to Concept Mapping

become valuable learning aids to the classroom topics and effective ways to help students structurally organize their knowledge.

Concept mapping can be a fun and effective classroom tool to learn in meaningful ways. Students benefit from the ready-to-use map inventory approach without the need for either faculty or students to first acquire the skill of concept mapping. However, we hope this encourages educators to eventually introduce the skill to students (since this maximizes the value as a learning tool) as well as experiment further with the use of the maps as instructional tools. Planning is essential before introducing a student-prepared concept-mapping task.

### ***Step-by-Step Approach to Introduce Concept Mapping as a Skill to Students***

Steps 1 through 8 described below provide a guidepost for the type of steps that should be undertaken to plan for a successful concept mapping exercise in class.

Each step is briefly discussed below.

**Step 1:** In planning a semester course, set aside time in the class syllabus for concept mapping activities or be willing to substitute these activities for something else.

The first step is to recognize that a concept-mapping task requires time. In order to introduce this tool in the classroom, faculty must plan ahead. It might mean giving up other pre-planned activities or taking away from regular classroom activities, trade-offs that are well worth it for the learning benefits that could be attained.

**Step 2:** Introduce student to a concept map and its intended benefits.

The discussion and examples provided in this paper are adequate to accomplish step 2. One of the benefits of introducing the ready-to-use maps first is that students will understand the purpose and benefits of concept mapping, before undertaking an assignment on their own.

**Step 3:** As homework, have the students practice creating a concept map by using familiar concepts such as a music, TV show, video, or movie concept map.

An important step in successfully integrating concept mapping into the classroom is to first allow students to practice in familiar territory. Initially asking students to use an unfamiliar technique with unfamiliar material (i.e., accounting concepts) can be a recipe for disaster. For example, when introducing concept mapping in an introductory financial accounting course, students were asked to draw a concept map, as a homework assignment, that visualized their ideas and concepts of “music,” a concept that each student could immediately relate to but in different and unique ways. Three students received extra class points to draw their music concept maps on flip chart paper to present in the next class. As the music maps were discussed in the next class, each student could immediately relate the flip-chart maps to his/her own map and

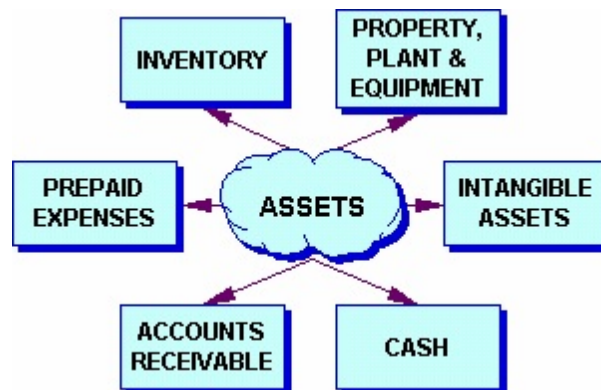
compare it to classmates. This shows how concept maps are different yet similar, how a concept map is created, and how ideas and concepts are linked. These initial activities enable students to become comfortable with the mechanics of drawing concept maps before tackling a less familiar and more challenging subject in the accounting domain.

**Step 4:** As homework, choose a simple accounting concept for students to practice creating a concept map. Provide some structure for the types of items to include in the map.

This extends the idea in Step 3 – allowing students to get comfortable with drawing a concept map in familiar territory by adding a simple, straightforward map in the accounting domain. Step 3 and 4 increases students’ understanding of concept maps and helps develop confidence that a successful group-mapping task can be achieved. For example, in step 4, you might ask the students to prepare a concept map on “Assets” that includes a single hierarchy of different items that constitute assets on a balance sheet. It might look something like Figure 6.

**Step 5:** Announce a group concept mapping task for a subsequent class, as a method to wrap up a unit, such as the income statement or statement of cash flows. Require students to prepare in advance for this, by placing structure on the assignment.

The purpose of this step is to place some structure on the group-mapping task since students are still relatively inexperienced in creating concept maps. By identifying the key components of the maps, it enables students to organize their thinking and make their preparation more effective. Ideally, no structure is placed on a map – this promotes the greatest creativity but also poses the greatest risk of confusion and failure. Since you want this to be a successful, positive learning experience, placing some structure on the assignment creates guideposts for the mapping assignment. The group mapping task set forth in Figure 7 is an



**Figure 6.** An example of a simple concept map in the accounting domain.

example of a structured assignment even though it might look unstructured. The students prepared a concept map on “The Income Statement” as the main idea of the map, which had to include ideas and concepts relating to four different areas: (1) components of the income statement, (2) purpose of the income statement, (3) usefulness of the income statement (including financial statement analysis), and (4) the limitations of the income statement. To accomplish this, each student individually prepared ideas and concepts in advance.

**Step 6:** On the day of the group-mapping task, assign the groups (4-5 in a group) and have flip chart paper taped to the walls around the classroom for each group assigned. Give each group of students a colored marker and plenty of post-it notes to use to record and place their concepts and ideas on the flip-chart paper.

The map shown in Figure 7 is the end product of the structured group mapping assignment. This is nothing more than flip chart paper taped to the wall, colored markers, lots of post-it notes®, and a bunch of ideas and concepts that students developed on their own. Without the benefit of concept mapping software in the classroom or a lot of mapping experience, the post-it notes provide a flexible and forgiving medium for students to create ideas and concepts, place them on the map, and move them as necessary until they are satisfied they have created the picture they want to portray (minimizing frustration with the map creation process).

Studying Figure 7 shows students successfully completed the group mapping task requirements set in advance. By bringing together all of the ideas and concepts developed by each student, a concept map is created in an organized framework that reflects the entire group’s input. Figure 7’s session was an energized, collaborative session, with students learning from each other and reinforcing information previously learned about income statements. While the students created their maps, the instructors walked around to encourage their work and stimulate ideas. Keeping in mind that the group assignment is structured, even though concept mapping is a creative, unstructured activity, it is important to remember that each group will likely create a different looking map with different ideas and concepts to meet the objectives of the assignment. This is, of course, one of the greatest benefits of the tool. Concept mapping allows students creative expressive of ideas and concepts without the need to formalize their thoughts in grammatically correct sentences, such as in a traditional written assignment.

Any in-class group mapping assignment requires students to organize their ideas and prepare the team map as they learn from each other. This develops greater ownership in knowledge representation and increases the likelihood that students retain what has been learned. This, in turn, facilitates the understanding and synthesis of the knowledge before it is lost. The on-going learning process enhances students’ ability to obtain meaningful knowledge and skills, which can be tested later in a variety of ways. Some educators use concept mapping in exams as an evaluation tool while others use it as a learning tool to assess or reinforce students’ learning progress, as done in this paper. Other faculty might prefer to continue using more traditional written work such as papers or essays as a way to validate learning.<sup>2</sup> Regardless of the approach

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<sup>2</sup>See Wolcott, etc. for an excellent discussion on how to plan and improve a research design when testing and developing critical thinking skills.

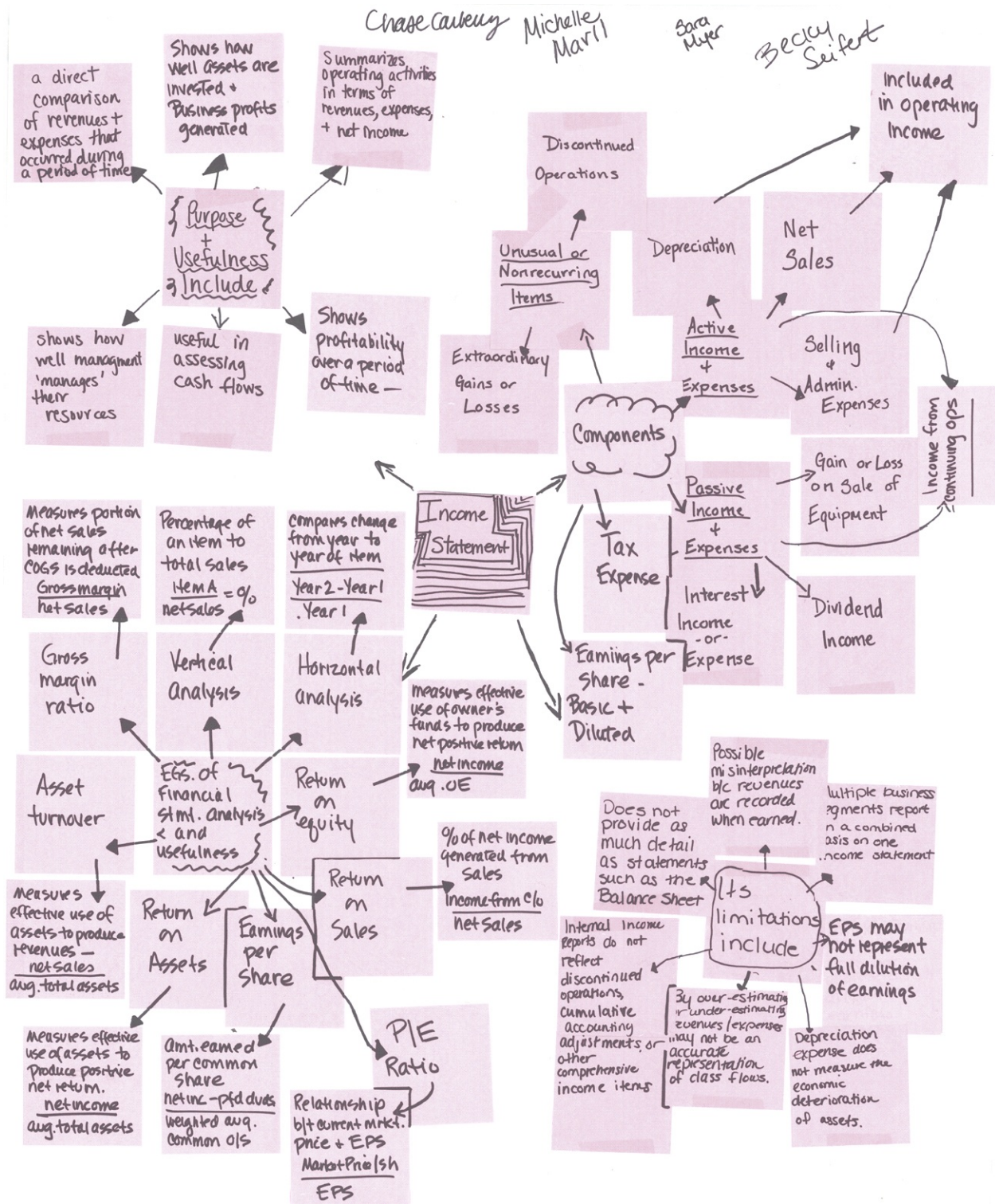


Figure 7. An in-class income statement concept map created by introductory financial accounting students using post-it notes and flip chart paper.

used, concept-mapping activities help students organize what they know and prepare more organized responses to traditional assignments since it facilitates the structure of knowledge.

**Step 7:** Grade the group work on an overall qualitative basis; don't get into the detail.

One of the natural fears of using an assignment like this is how to grade it. It is unstructured and does not lend itself easily to traditional grading grids.<sup>3</sup> Thus, step 7 is important advice. Grade the group work on a “big picture” qualitative basis, without getting into how many ideas or concepts each group actually created or why each group map looks different. Ask yourself some of the following questions in deciding on an appropriate grade: Did the group complete the structured task as assigned? Did everyone in the group seem to participate equally and collaboratively to achieve the group task? Does the map portray an informational picture of the required elements? Do the ideas and concepts appear to represent valid items? Are there incomplete or invalid ideas and concepts represented (you might take off points for these)?

**Step 8:** Ask for written feedback in the next class regarding the activity.

Ask students immediately for their input in the next class. Allow them to communicate anonymously, if that produces more input. Was the group-mapping task helpful to learning whatever subject was the focus of the activity? How could the activity be improved for the next group-mapping task?

If you followed the steps suggested, the students will have had time to understand what concept mapping is all about, practiced doing a few simple non-accounting and accounting maps, and have had a positive experience in the group-mapping activity. However, each class experience is different. Your own individual comfort level and class experience, coupled with your willingness to spend time on these activities, will dictate how much you can do and how much students will benefit.

#### **POSSIBLE LEARNING OUTCOMES DERIVED FROM A LIMITED RESEARCH STUDY ON INTRODUCTORY ACCOUNTING STUDENTS**

Most of the research findings on concept mapping are classroom-research oriented, but some empirical studies exist to validate its effectiveness (relevant empirical studies are discussed under the research finding). While these studies infer quantifiable outcomes from the use of concept mapping, none relate to the accounting discipline. This is not surprising due to the very non-traditional nature of the very strategies discussed by the authors in this paper, and given the fact that accounting pedagogies have typically focused on “numbers.”

While there have been no published empirical findings in the accounting discipline, the authors have collected some preliminary research data that suggest quantifiable learning benefit outcomes by using end-of-unit concept mapping activities as set forth in this paper. The research

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<sup>3</sup>There is a scoring model for grading concept maps (see Novak and Gowin, 1984. pp. 36-37).

claims need further validation, but these data coupled with the step-by-step implementation guide, provide an initial framework for future studies to be conducted.

The research question addressed in this study was, “Do Accounting 202 [second semester introductory accounting students] who are exposed to instructional methods that involve concept mapping achieve significantly higher interim unit test grades than Accounting 202 students who are exposed to traditional instructional methods?” The sample in the study consisted of 64 students during the fall and spring semesters in a comprehensive state university. The sample was believed to be a random sample based on the nature of course population. The fall semester class of 29 students was labeled the control group. The results of interim unit exams of the control group were evaluated after traditional instructional methods were used. The spring semester class of 35 students was labeled the experimental group. The results of interim unit exams were evaluated for this group after the group participated in two end-of-unit concept mapping activities (one relating to each interim exam). Figure 7 illustrates a typical end-of-unit activity that resulted from the concept mapping activities undertaken in the experimental group.

Since the study involved the investigation of events that had already occurred, an *ex post facto* design was utilized. The level of significance utilized was  $p$  value = .01 and the decision in this study was directional in nature. The researchers were only interested in the results if the means of the experimental group exceeded the means of the control group. Thus, the region of rejection was one-tailed; 1% at the upper end of the scale.

The study tested a directional hypothesis relating to the difference between the means of two independent samples. A *t*-test assuming equal variance was used for two reasons. First, the *t*-test is the most common statistical test to compare differences between two groups and can be used with either independent or dependent samples. The samples in this study were independent samples because the two groups had no relationship to each other and it was assumed that the subjects were randomly assigned from a common population. Second, the presumption that the subjects were randomly assigned dictated equal variances rather than unequal variances.

The independent variable was the method of instruction applied prior to the conduct of the study: traditional instructional method versus instruction method that involves end-of-unit concept mapping activities. The dependent variable was the test grades earned by students. The test grades used an interval scale. The demographic data of the sample was analyzed using descriptive statistics (number of observations (“*n*”), mean, standard deviation, degrees of freedom, *t* statistic, and *t* critical value).

Table 2 presents the results of comparing the mean unit test of each group on the Unit 2 interim test (the income statement) at the  $p = .01$  level of significance. Table 3 presents the results of comparing the mean unit test grades of each group for the Unit 3 interim test (statement of cash flows) at the  $p = .01$  level of significance.

On both interim unit tests, the results of the study rejected the null hypothesis (that there would be no significant difference) at the stated level of significance, thereby supporting the hypothesis that “Introductory accounting students exposed to instructional methods that include concept mapping will have statistically higher means on the interim unit test grades than introductory accounting students exposed to traditional instructional methods.” While limited given the sample size, the results of this study were significant in several ways. First, at a rigorous level, it provided initial empirical data that concept mapping might be a viable instructional strategy and tool to improve learning outcomes in accounting. It also provided evidence of the investigative value of non-traditional and innovative techniques from other

**TABLE 2**  
**Comparison of the Means on Interim Unit 2 Test Results**

	<u>Control Group</u>	<u>Experimental Group</u>
n	29	35
Mean	73.90	86.46
Standard Deviation	9.66	17.45
Degrees of Freedom	62	
t-Statistic	3.64	
t-Critical One-Tail	2.39	

**TABLE 3**  
**Comparison of the Means on Interim Unit 3 Test Results**

	<u>Control Group</u>	<u>Experimental Group</u>
n	29	35
Mean	81.67	88.67
Standard Deviation	11.61	9.29
Degrees of Freedom	62	
t-Statistic	2.68	
t-Critical One-Tail	2.39	

disciplines to improve accounting education, an approach supported and valued by the profession (AAA, 1986; Arthur Andersen, et al., 1989; AECC, 1990; Albrecht and Sack, 2000). The results adds further evidence to the previous classroom-related research findings that concept mapping is a viable tool that can aid the learning process, even in accounting.

### CONSTRAINTS

While the benefits of using concept mapping in introductory accounting courses seem evident, it does not come without cost or constraints that must be consider. There are only a limited number of class periods over which course material can be covered. As educators, each of us already feels the pressure of needing to cover more and more accounting material each semester as the discipline expands, in addition to the many other skills our respective programs emphasize (e.g., oral and written communication, spreadsheet, and research skills).

The single largest constraint of concept mapping is the amount of time that instructors are willing to set aside for meaningful learning and the learning curve to acquire the skill. Concept mapping takes classroom time to learn and perform effectively. Obviously, to use this enriching tool we must carefully plan our course to allow for more reflective time during the semester. Once students learn the skill, it still takes in-class time to carry out the activities. To gain the most from this skill, it should be continually reinforced and used throughout a course and ideally throughout a curriculum. Planning these types of learning activities inevitably means less course textbook material coverage. Our own personal view is the sum of these costs and

constraints are tradeoffs well worth it, if indeed we are committed to focus on improving how students learn and how we enable them to learn.

A second constraint arises due to the nature of concept mapping activities. Concept mapping is a highly individual and creative process. Although scoring systems have been developed (Novak and Gowin, 1984), there is no quantitative solution to a concept mapping exercise. Each student or each group of students will produce something different. Thus, an important limitation arises in the ability of the instructor to accept and gain comfort in this creative process, realizing that students (or groups of students) will create different, yet valid work products. In many respects, it requires the instructor to become more visually oriented and nurture their own creative abilities. Not every instructor will be comfortable in this zone.

### CONCLUSION

The ideas and materials presented in this paper are intended to stimulate further reflection and experimentation on the value of concept mapping as a meaningful learning tool in the accounting classroom. More meaningful learning activities improve accounting students' thinking skills. It can work well for introductory accounting courses as well as in more advanced courses as an "enabling" skill, where knowledge complexity and synthesis are even more critical. A wealth of research exists on the effectiveness and flexibility of this tool in other disciplines that merit serious consideration in our own. Our own classroom experiences, as described in this paper, have been positive and fruitful learning experiences for students. In addition, our limited research study shows increased learning outcomes, as measured by improved test scores. We encourage others to experiment with concept mapping to further validate the evidence found to generalize the results to the entire spectrum of accounting.

Concept mapping is not the only answer to introducing meaningful learning activities in the classroom. However, the tool is symbolic of the kind of pedagogy we need to introduce to achieve the developmental goals of the early change agents in our profession and aid in reversing the "perilous" trend that Albrecht and Sack (2000) have envisioned.

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## APPENDIX I

DESCRIPTION OF THE CONCEPT MAP INVENTORY ([Click here to open all maps](#))

(Click on individual map numbers to open each map separately)

<a href="#">Map 1</a> : Economic Events	Displays how financial statements are derived from economic events. Students are only introduced to the basic names of the financial statements in this initial map.
<a href="#">Map 2</a> : Benefit of Financial Statements to Users	Extends the understanding that basic financial statements provide a benefit to users. Those users are identified along with why they need to rely on financial statements. Audits of financials and its relationship to stock and bond markets present financial statements in a broader context of their use in business and shows how pervasive accounting information is.
<a href="#">Map 3</a> : Components of the Balance Sheet and Income Statements	This map provides details regarding the balance sheet and income statement by displaying the underlying components of each statement along with definitions and examples. The connection between the income statement items (revenues and expenses) and retained earnings is shown. Also presented are earnings per share and book value. While these last two concepts are not taught early in the course, it does allow the students to later connect these ideas.
<a href="#">Map 4</a> : Major Segments of the Statement of Cash Flows	Shows the major segments (activities) in the statement of cash flow (operating, investing, financing). This is a simple, straightforward map and a good map to use for the first time.
<a href="#">Map 5</a> : Business Forms of Entities	This map captures the various business forms (sole proprietorships, partnerships, corporations) as well the various industry types (manufacturers, merchandisers, construction, service).
<a href="#">Map 6</a> : The Matching Principle	Displays a simple overview of the matching principle and how it is applied; useful when discussing expenses and their relationship to the income statement, and also later in a course when capital expenditures are introduced.
<a href="#">Map 7</a> : Accounting Cycle	Many introductory books present some type of display to show the sequence in the accounting cycle. Map 7 is a supplement presented in somewhat of a different form, which may be more meaningful for students.
<a href="#">Map 8</a> : Relationship between Revenues and Cash Flows	This map depicts the relationship between revenue, accounts receivables, and cash. Many students have difficulty with the concept of accrual accounting and this map shows that cash can be paid

beforehand (results in a liability), at the time of sale, or after the sale (accounts receivable). This reinforces the unearned revenue concept from the adjusting entry chapter and shows how the liability is later reduced in the earnings recognition process. This map also extends the concept of accounts receivables and the determination of whether receivables will be collected (allowance account and bad debt expense), ultimately connected to the concept of “net realizable value.” This is a comprehensive map and segments of it can be introduced at different times. However, it provides a meaningful learning tool to pull together the relevant and related concepts on revenues and cash.

**Map 9:** Relationship Between Inventory and Cost of Goods Sold

This map shows the relationship between inventory and cost of goods sold. While this map is simplistic, it incorporates the ideas of perpetual versus periodic inventory methods, cost flow assumptions, and the lower of cost or market rule. The concept of “gross profit” on the income statement is also presented.

**Map 10:** Usefulness of the Balance Sheet in Decision-Making

This map is best used when financial ratio analysis of the balance sheet is introduced, to tie together how the balance sheet can be used for decision-making. It also illustrates how other relevant sources of analysis, such as notes to the financial statement, MD&A, or capital and liquidity resources discussions, add value to the process. This map reinforces the importance of how accounting information can be used for decision-making.

**Map 11:** Usefulness of the Income Statement in Decision-Making

This map is best used when financial ratio analysis of the income statement is introduced, to tie together how the income statement can be used for decision-making. It also illustrates how other relevant sources of analysis, such as notes to the financial statement, MD&A, significant accounting policies, add value to the process. This map reinforces the importance of how accounting information can be used for decision-making.

**Map 12:** Comparison of financial and managerial income statements; classification of costs and contribution margin analysis

The first map (Map 1 of 2) begins with a comparison of a traditional financial and managerial contribution margin income statement, focusing on how operating expenses are reclassified as variable or fixed. This is an excellent map to begin the discussion of CVP analysis. The first map is then tied to a second map (Map 2 of 2), which provides more detail on the contribution margin income statement, portraying contribution margin and how it can be used to make various profitability projections. This map shows how to calculate break-even in sales and units. This approach is also a good example of how to keep maps from becoming overly complex, by breaking them up into pieces.