Using Family Science Concept Maps to Gain Higher Order Student Learning Outcomes

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ABSTRACT. This article describes how an introductory online family science class used concept maps and the impact of the maps on higher order learning. A concept map is a graphical tool for organizing knowledge. Concept maps show relationships between concepts in a way similar to how road maps represent locations of highways and towns. Concept mapping has also been shown to increase higher order learning. This article describes the impact of concept maps on higher order learning by comparing pre- and post-student narrative summaries of internal dynamics of families. Based upon the described methodology, results showed that concept mapping did not improve higher order learning. When outliers were removed from data, results demonstrated a small but significant improvement in higher order student learning.

Keywords: Scholarship of Teaching & Learning (SoTL), Family Science, Concept Maps

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This article is the first known attempt to use concept mapping in the context of the Scholarship of Teaching and Learning (SoTL) in family sciences. This article begins with a description of concept maps, the underlying theory of concept maps, how learners can use them, and their effectiveness for learning. After this introduction, this article describes the impact concept mapping had on higher order students learning outcomes.

To place this article in the larger SoTL context, we define and identify principles of good practice in SoTL. Hutchings and Shulman's (1999) frequently cited definition is helpful:

> [A] scholarship of teaching is not synonymous with excellent teaching. It requires a kind of "going meta," in which faculty frame and systematically investigate questions related to student learning—the conditions under which it occurs, what it looks like, how to deepen it, and so forth—and do so with an eye not only to improving their own classroom but to advancing practice beyond it. (p. 13)

Felten's (2013) five principles of good SoTL practice are also helpful in clarifying what constitutes SoTL work: (a) student learning is the focus, (b) understanding context is critical, (c) sound methodology is followed, (d) students are partners in their participation, and (e) results are made public.

Teachers in higher education often lack formal training in SoTL. Knowing how to begin to engage in SoTL can be a daunting task. To make this task less difficult, Pat Hutchings (2000) of the Carnegie Foundation developed a taxonomy describing scholarly questions that can be asked in SoTL. These questions can be classified into four types, with each providing a different entry point into SoTL activities. These entry points are: (a) What works?, (b) What is?, (c) Visions of the possible, and (d) Theory building. "What works?" questions evaluate effectiveness of different teaching approaches. "What is?" questions describe the approaches' constituent features. "Visions of the possible" questions break new ground when the instructor wonders and pursues the question of, "How would learning change if…?". Lastly, "theory building" takes place when SoTL models create new meanings for what the instructor and learner do together.

For faculty, the methodology of "What works?" questions often parallel their field-specific methods of inquiry, making it easier to understand and carry out SoTL projects. Because of this similarity, "What works?" questions are often the entry point for most teachers wanting to engage in SoTL. This article is an example of a "What works?" question because it describes the impact of family science concept maps on higher-order student learning outcomes.

What are Concept Maps?

Concept mapping is a graphic tool for organizing and representing knowledge. Concept maps are constructed in a hierarchical manner, with the most inclusive and general concepts at the top of the map, and less inclusive concepts near the bottom or sides of the map (Hay, Tan, & Whaites, 2010; Novak & Canas, 2008). In concept mapping, concepts (ideas) are enclosed in a circle or box. A line drawn between the two concepts indicates a relationship between the concepts. The word on the line called the "linking word" describes the relationship between the concepts. Two or more concepts along with the linking word form a meaningful statement, technically known as a proposition. Cross-links are used to show how concepts in different domains of the map may be related (Novak & Canas, 2008). Thus, a concept map is a graphic organizer distinguished by the use of labeled nodes, which are concepts, and links denoting relationship among concepts. Links may or may not be directional and may or may not be labeled (Canas et al., 2003; Nesbit & Adesope, 2006). Since this is graphical map, each propositional statement is laid bare for others to see and becomes a powerful teaching tool because learners' understanding is observable. When the same learner maps the same topic repeatedly, these snapshots of various maps can be assessed for cognitive change (Hay et al., 2010). (See Figure 1 for a concept map example of the internal dynamics of strong couples)

Joseph D. Novak and his research team at Cornell University developed concept mapping in the 1970s as a means to understanding changes in children's knowledge of science over time. Novak asked children as young as six years old to develop concept maps that represented their understandings of such topics as energy, plant growth, and molecules. Novak and his colleagues tracked how learner's concept maps changed throughout the elementary school years as they continued receiving focused lessons on specific science topics (Novak & Musonda, 1991). Concept mapping as a learning and assessment tool has been used as early as kindergarten years (Birbili, 2008), but is most prominent in elementary school, middle school, high school, and undergraduate and graduate training (including nursing and medical schools) (Schwendimann, 2015). Concept mapping has been successfully implemented in science, technology, engineering, and math (STEM) subjects (including medicine), and in language, history, and education (Schwendimann, 2015). Ambrose, Bridges, DiPietro, Lovett, & Norman, authors of the seminal book *How Learning Works: 7 Research-Based Principles for Smart Teaching* (2010), recommend concept mapping because it meets many criteria for effective instruction. To understand why concept mapping meets effective instruction criteria, one must understand the constructivist nature of its underlying theory.

Underlying Theory of Concept Maps

Novak and his team (Novak & Canas, 2008) drew upon the learning psychology of David Ausubel (Ausubel, 1968) to devise a better method of tracking change in children's knowledge of science. These efforts resulted in concept maps: "The most fundamental idea in Ausubel's learning psychology is that learning takes place by the assimilation of new concepts and propositions into existing concept and propositional frameworks held by the learner" (Novak & Canas, 2008, p. 3). Ausubel's learning psychology built on Jean Piaget's (1952) knowledge of learning through processes of accommodation and assimilation. Through these processes, individuals construct new knowledge from their experiences (constructivism). Between birth to age three (Macnamara, 1982), children begin recognizing patterns in how their world operates and they identify these patterns using labeling concepts they have learned from language or symbols that older children and adults use. This early learning of concepts is called *discovery learning* and parallels Piaget's sensorimotor and preoperational stages. After age three, *reception learning* takes place as the young child is able to use language to get clarification of old concepts, of how these concepts relate to their understanding of their current worlds, and of how new concepts fit into their schemas (Ausubel, 1968).

Along with distinguishing between discovery and reception learning, Ausubel made important distinctions between rote and meaningful learning. Rote learning does not engage learners because it stems from repetition rather than explanations or from relating content to concepts that learners already know. Meaningful learning allows students to apply material to content that is already familiar to them.

Three conditions need to be met for meaningful learning to occur (Novak & Canas, 2008):

1. The material to be learned must be conceptually clear and presented with language and examples relatable to the learner's prior knowledge.
2. The learner must possess relevant prior knowledge. This condition can be met after age 3 for virtually any domain of subject matter, but it is necessary to be careful and explicit in building concept frameworks if one hopes to present detailed specific knowledge in any field in subsequent lessons.
3. The learner must choose to learn meaningfully. The one condition over which the teacher or mentor has only indirect control is the motivation of students to choose to learn by attempting to incorporate new meanings into their prior knowledge, rather than simply memorizing concept definitions or propositional statements. (pp. 3-4)

Novak and Canas (2008) believe that one reason concept mapping is a powerful facilitator of meaningful learning is that it becomes an explicit exercise in creating a template or scaffold as it organizes bits of knowledge (propositions: how two concepts are related to each other) into a meaningful whole. The process of developing accurate propositions by using correct linking words between concepts involves what Bloom, Engelhart, Furst, Hill, and Krathwohl (1956) identified as high levels of cognitive performance (namely evaluation, synthesis, and analysis of knowledge) and what Krathwohl (2002) later revised as creating, evaluating, and analyzing knowledge. Being able to engage in meaningful learning at Bloom's higher levels of cognitive performance is important to learners because solving complex problems requires connecting ideas and eliciting relations among ideas (Schwendimann, 2015). Placing ideas into frameworks and continuously seeking to understand connections help learners solve complex problems (Klein, Moon, & Hoffman, 2006). Developing family science concept maps in a general education university course could be the start of helping family life educators or family therapists help families solve complex problems.

How Concept Maps can be used by Learners and Teachers

Dailey and Torre (2010) reviewed 35 studies of concept mapping and concluded that concept maps are used in four main ways: (a) to promote meaningful learning, (b) to provide more resources for learning, (c) to enable teachers to provide feedback to learners, and (d) to conduct assessment of student learning.

Concept maps promote meaningful learning because they help learners integrate basic information and move from linear thinking patterns to more systemic, holistic patterns. This integration occurs when learners link new knowledge with previous knowledge, creating more integrated knowledge structures (Dailey and Torre, 2010). Classified in this manner, concept maps are the teaching strategy (independent variable), similar to course readings, class discussions, or a “flipped” class.

Concept mapping can be an additional resource for learning when learners use them to demonstrate mastery of course content (Daley & Torre, 2010). Concept mapping allows the learner to be iterative and reflect on how his or her understanding of a particular body of knowledge has changed over time (Canas et al. 2003).

Kinchin and Hay (2000) have identified how concept maps can be communication tools between teachers and learners. When learners create concept maps, their understanding of a core body of knowledge is observable to the teacher. This allows the expert teacher to give feedback to help the learner to clarify propositions and relationships. As teachers and learners discuss, think about, and revise concept maps, this process leads to what Novak and Gowin (1984) call “shared meaning-making”.

Teachers continue to use conventional forms of assessment such as true/false or multiple-choice questions to gauge student learning. These types of assessment focus on rote learning by asking learners to recall isolated ideas. Assessment of concept mapping shifts the focus away from rote recall of ideas to how learners construct meanings of inter-related concepts (Hay, 2008; Popova-Gonci & Lamb, 2012). Conceptualized in this manner, concept maps equate to the dependent variable and are used to measure effects of other teaching strategies, much like multiple-choice or true/false assessments.

The Effectiveness of Concept Maps on Learning and Assessment

As mentioned above, when concept maps are viewed as a learning tool they are considered the independent variable. Two meta-analyses have reviewed effects of concept maps used as learning tools. In the first, Horton et al. (1993) found that concept maps used as learning tools positively produced medium effect sizes on student achievement and large effect sizes on learners’ attitudes. They also found there were larger effect sizes when learners worked in groups rather than individually. In the second meta-analysis, Nesbit and Adesope (2006) compared concept mapping to other forms of learning activities such as reading text passages, attending lectures, and participation in class discussion. They found that concept maps were more effective when assessing knowledge retention and transfer than were these other forms of learning activities, with effect sizes ranging from small to large depending on the use of concept maps. Nesbit and Adesope also found concept maps slightly more effective compared to other constructivist activities such as writing summaries and outlines, even though the small difference raises doubt about pedagogical significance. Lastly, benefits of concept mapping were more pronounced in studies with better designs, such as those using random assignment to participate in the treatment group.

When used as assessment tools, concept maps are used as the end result or dependent variable, similar to multiple-choice or true/false questionnaires. When used as assessment tools, concept maps can be used for assessing previous knowledge of ideas as well as conceptual understanding over time. When used as an assessment tool, the actual concept map is evaluated. For example, Kinchin, Hay, and Adams (2000) showed there are three basic concept map structures, spokes, chains, and networks, with movement from a spoke to a network model representing more integrated learning (Hay and Kinchin, 2006). Another example of using concept maps as the end result, or assessment tool, is the Concept Mapping Marking Sheet (Hay, et al., 2008) in which concept maps are evaluated for (a) conceptual richness, (b) linkage and linkage quality, (c) evidence of understanding, and (d) hierarchy and structure. This concept scoring sheet consists of 16 indicators with attributes ranging from 1-5 for a range of 16-80, thus making an easy comparison of concept maps used before learning activities compared to concept maps used after learning activities.

Since concept maps have such a strong theoretical foundation that helps our understanding of student learning, they provide excellent teaching tools that need further examination using rigorous requirements of SoTL. Along with the fact that there are few SoTL projects that have used concept maps generally, and none specifically, related to family science, this article fills a large gap because it addresses this research question: Do family science concept maps lead to gains in student higher order learning outcomes?

Method

Participants

Participants were undergraduate college students enrolled in an online, general education social science course at an intermountain land-grant university during the fall 2015 semester. The course catalog description calls the class an “overview of couple and family relationships.” Of the ninety students enrolled in the class, thirty participants who completed pre- and post-essays were selected from a table of random digits to evaluate changes in student learning. There was no collection of demographic information on the participants.

The Course

Students in the course were asked to write four-page, double-spaced papers at the beginning and end of the semester, comparing and contrasting strong couples and families with struggling couples and families. Assessment of these papers was the dependent variable. In between the two papers, students completed three concept maps (independent variable). With the concept maps serving as the learning activity (independent variable) and assessment of the four-page paper serving as the dependent variable, this design fits Dailey and Torre’s (2010) first description of how concept maps are used: “promoting meaningful learning.” To complete each concept map, students received a set of 20-25 words. Students used these words to construct their concept maps. The three concept maps focused on:

1. Developing Intimate Relationships (X_1)
2. Internal Dynamics of Families (X_2)
3. Internal Dynamics of Couple Relationships (X_3)

The following diagram illustrates the course design using the following symbols: O = observation of dependent variable and X = Concept Map Assignment. The O's are numbered with subscripts from left to right based on time order. The four-page paper at the beginning of the semester was O_1, and the four-page paper at the end of the semester was O_2.

Fall 2015 O_1 X_1 X_2 X_3 O_2

SoTL Study Design

This study was a one-group pretest-posttest research design. The design was appropriate for this study because it allowed quantification of intra-individual change in student learning. In the absence of a control group, pre/post comparison still allows for measurement of change over time, although it does not allow for causal statements about why change occurred.

Measuring Student Learning

This study measured learning based upon open coding methods that Anderson, Bliese, & Bradshaw (2014) developed. Anderson and his graduate students described a coding method for analyzing graduate student essays in a human development class. Over an eight-week period, Anderson's students viewed the documentary *56-Up* (Apted, 2013) as an interrupted case study. These learners wrote weekly reflective essays in which they made predictions and hypotheses about the children in *56-Up* based on concepts from various human development theories. Using principles of open coding (Corbin & Strauss, 2015) and Bloom's Revised Taxonomy (Anderson & Krathwohl, 2001), Anderson and his graduate students (2014) coded the learner essays by analyzing each sentence of each essay and assigning it a value based on the *Quick Flip Questions for the Revised Blooms Taxonomy* (2001). The values were as follows: 6 - Creating, 5 – Evaluating, 4 – Analyzing, 3 – Applying, 2 – Understanding, and 1 – Remembering. This same methodology, described by Anderson et al. (2014), was used for coding each sentence of each pre- and post-paper for the 30 participants selected for this study. Using this measurement method, the null hypothesis for this study is that there are no differences between scores of students' pre- and post-essays. The following describes the process of preparing pre- and post-papers for coding and gives examples of each coding value.

Coding Pre and Post Essays

The lead author removed participant-identifying information from pre- and post-essays. Next, two undergraduate research assistants prepared the papers for open coding. Each essay was assigned a number, 1-30. Each essay was then separated by sentences and hard breaks between paragraphs; then, each sentence was numbered. The pre- and post-essays were then printed, for a total of 60 essays. The papers were three-hole punched and organized into one three-ring binder, with tabs separating papers of the 30 participants. To increase efficiency of the coding process, a large poster was created to detail criteria based on Bloom's Revised Taxonomy flip chart, examples, and the conceptualization of each level. See Table 1 for indicators and examples of each of the six levels of Bloom's Revised Taxonomy.

Practice sessions were held to refine the coding process and improve interrater reliability. The results of the interrater analysis between the two undergraduate students are Kappa = 0.896 with p = .000. This amount of agreement between the two coders is considered outstanding (Landis & Koch, 1977).

Results

Table 1 contains frequency and percentage results of the student's (n = 30) papers for each of the six levels of Bloom's Taxonomy. In pre- and post-papers, the highest category was analyzing, with 30.1% in the pre-paper and 28.2 % in the post paper. From the pre-paper to the post-paper, the Remembering category had a percentage change score of -2.1%, Understanding -1.1%, Applying +4.5%, Analyzing -1.9%, Evaluating +.6%, and Creating +.1%. Therefore, the largest percentage movement came in the Applying category. Using the six levels of Bloom's Revised Taxonomy, mean scores of pre- and post-papers are also presented in Table 1. The pre-paper mean score was x = 2.55 and the post-paper mean score was 2.59 for an increase of .04. These mean score differences between pre- and post-papers were not significant: t (1,3793) = -1.251, p = .059, with a small effect size of d = .04 (Cohen, 1988)

During the process of entering data into the statistical package, the coders recognized that two students had unusually high frequencies in their pre-papers within the Analyzing category. In the pre-paper, the average number of times participants were coded in the Analyzing category was x=18, with a sd = 14.33. In reviewing data for these two students, they were both found to be above 2 standard deviations from the mean, meeting the criteria of being considered statistical outliers, and were removed from the data. Table 2 represents the data with these two outlying students removed. In table 2, the highest pre-paper category was Remembering with 28.3%, following by Analyzing with 26.4%, Understanding with 25.7%, and then dropped to Applying with 18.3%. In the post-paper the highest percentage is in Analyzing with 27%, followed closely by Remembering at 25.7% and with Understanding and Applying close behind. From the pre-paper to the post-paper, an interesting pattern emerges in that the lowest levels of learning, Remembering and Understanding, experience a percentage decrease of 2.6 and 2.7 respectively, while the four higher order levels of learning all increase, the most significant being the Applying category, which increased by 3.7%. The pre-paper mean scores was x = 2.47 and the post-paper mean scores was 2.57 for an increase of .1. These mean score differences between pre- and post-papers were significant, t (1,3549) = -2.561, p = .010, although the effect size continued to be small at d = .08. When the two outlying students were removed from the data, the small magnitude change of .1 in increased higher order student learning was significant with a small effect size.

Discussion

We were disappointed in the small magnitude and small effect size of the positive change toward higher order learning. Although there was significant change in higher order learning when the two outliers were removed, this magnitude of change of .1 was still relatively small. Part of our disappointment stemmed from results of a pilot study we conducted during the spring semester of 2015 (Law, 2015). In this pilot study of 12 students, the mean score of pre-papers was 3.2, and the post score was 3.96, which resulted in a $t(1,761) = -11.37$, $p = .000$. Based on this pilot study, we had anticipated greater movement toward higher order learning.

Discussion sections of manuscripts are key components of the SoTL process because they allow authors to be iterative (Glassick, 2000; Shulman, 2011). In this process, teachers reflect on what they have done based on sound pedagogy, execution, and impact on student learning. Bass (1999) argues that this process moves teaching from terminal remediation to ongoing investigation. Through this iterative process, teaching improves over time.

As the three authors have assessed the results of this project, we offer this reflective critique based on the following: 1) Concept Maps do not result in higher order student learning in family science; 2) Coding issues; 3) Implementation issues; and 4) Measurement issues.

Concept Maps do not Result in Higher Order Student Learning in Family Science

Experts in learning agree that the theory underlying concept maps is sound (Ambrose et al., 2010; Novak & Canas, 2008; Schwendimann, 2014). In meta-analyses described previously, there is strong support for improved learning resulting from the use of concept maps (Horton et. al., 1993; Nesbit & Adescope, 2006). One contextual factor worth noting is that most previous studies have occurred in traditional sciences, but this study was conducted in family science, a social science field. Even though more research on social sciences needs to be done with concept maps, such strong support for concept maps in the traditional sciences makes it likely that our disappointing results stemmed from our methodologies. Before concluding that concept maps do not result in higher order student learning, the soundness of our methodologies, which we discuss next, needs critical evaluation.

Coding Issues

One positive outcome from this study was the very high interrater reliability of Kappa = 0.896 with p = .000. The two undergraduate students spent many hours reviewing criteria for the Revised Bloom’s Taxonomy (2001) and developing key indictors and examples. Although this resulted in impressive reliability, we must also consider validity. Did the examples capture the essence of Bloom’s six levels of cognitive performance? Before using this same methodology, conducting face validity analyses with family science experts is warranted.

Implementation Issues

Instructors generally deliver concept maps to students in face-to-face classes where there is live, real-time interaction as well as group input. It is common for instructors to give groups of students lists of 20-25 concepts and their focus questions, and then to ask them to construct concept maps individually or as teams. This process encourages interaction between students and can result in immediate feedback from the instructor. Hay et al. (2008) strongly advocates that this one-on-one training is essential for proper implementation of concept maps. It is important to remember that for this manuscript, results are from an online class. Students in this class learned about concepts from course readings and were expected to construct their own concept maps. While instructor feedback and evaluation on completed concept maps were provided, there was no instructor or peer feedback or evaluation given during the process of constructing the concept map.

Another implementation issue may have involved individual versus group development of concept maps. In this project, concept maps were developed individually without feedback from peers or experts during the development phase. Schwendimann (2015) advocates that learners work together in groups and develop team concept maps. This is supported by Horton et al.'s (1993) findings that learners who worked in groups had the largest effect sizes.

Results presented in the manuscript call for a focus on Felten's (2013) second principles of good SoTL practice, namely the importance of context.

Measurement Issues

The most critical question from this project may be this: Was the use of the pre-post papers a good assessment of the impact of concept maps on learning? Conceptualized in this manner, concept maps are the learning tool (or independent variable) and pre/post papers are the assessment of learning (or the dependent variable) (Schwendimann, 2015). Other methods of assessment are more proximal to the actual concept map, such as Hay et al.'s (2008) spoke-chain-net method or the expert scores of student maps.

This critical question of "assessment match" is more justified when one considers the two papers that were outliers. In these two papers, over 95% of scores were in the Analyzing category. This raises an interesting question: should students be able to score that high in the pre-paper when they have not yet been exposed to the course material? This also brings up the possibility that our list of 20-25 concepts may be too familiar to students. Ideas for making the 20-25 concepts more specific to the course should be considered. Lastly, student fatigue or lack of motivation needs consideration for all students. The two students who were removed scored considerably higher on the pre-paper than on the post-paper. Why? By the end of the semester they had completed four concept maps and four papers. The possibility students were not submitting their best work at the end of the course needs consideration. Novak and Canas (2008) identify student motivation as one of three conditions for meaningful learning. Generally speaking, students received high grading scores on their concept maps and papers. Did these high scores lead to students thinking they did not have to perform to their best abilities, which might be reflected in their ending work?

Another measurement issue was lack of connection between actual concept maps and quality of pre- and post-papers. Even though the learners completed concept maps, the authors did not measure quality of maps in valid ways.

In sum, while magnitude of the change in higher order student learning was less than expected, this article provides a clear example of a SoTL project that addresses a “What works?” question by evaluating effectiveness of family science concept maps. Using the iterative process of reflection, the authors are positioned to improve the identified coding, implementation, and measurement issues. Specific suggestions to continue the iterative process that defines SoTL are (a) refine face-validity of coding, (b) develop training modules for developing concept maps for online classes, (c) have learners work collaboratively on their concept maps with feedback from peers and experts, (d) assess actual concept maps using structural changes (spoke, chain, net) and expert scores, and (e) assess relationships between expert scores and mean scores of post-papers. Suggestions two and three will receive more scrutiny because they are contextual issues that are critical to SoTL work.

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Figure 1

Example of Family Science Concept Map

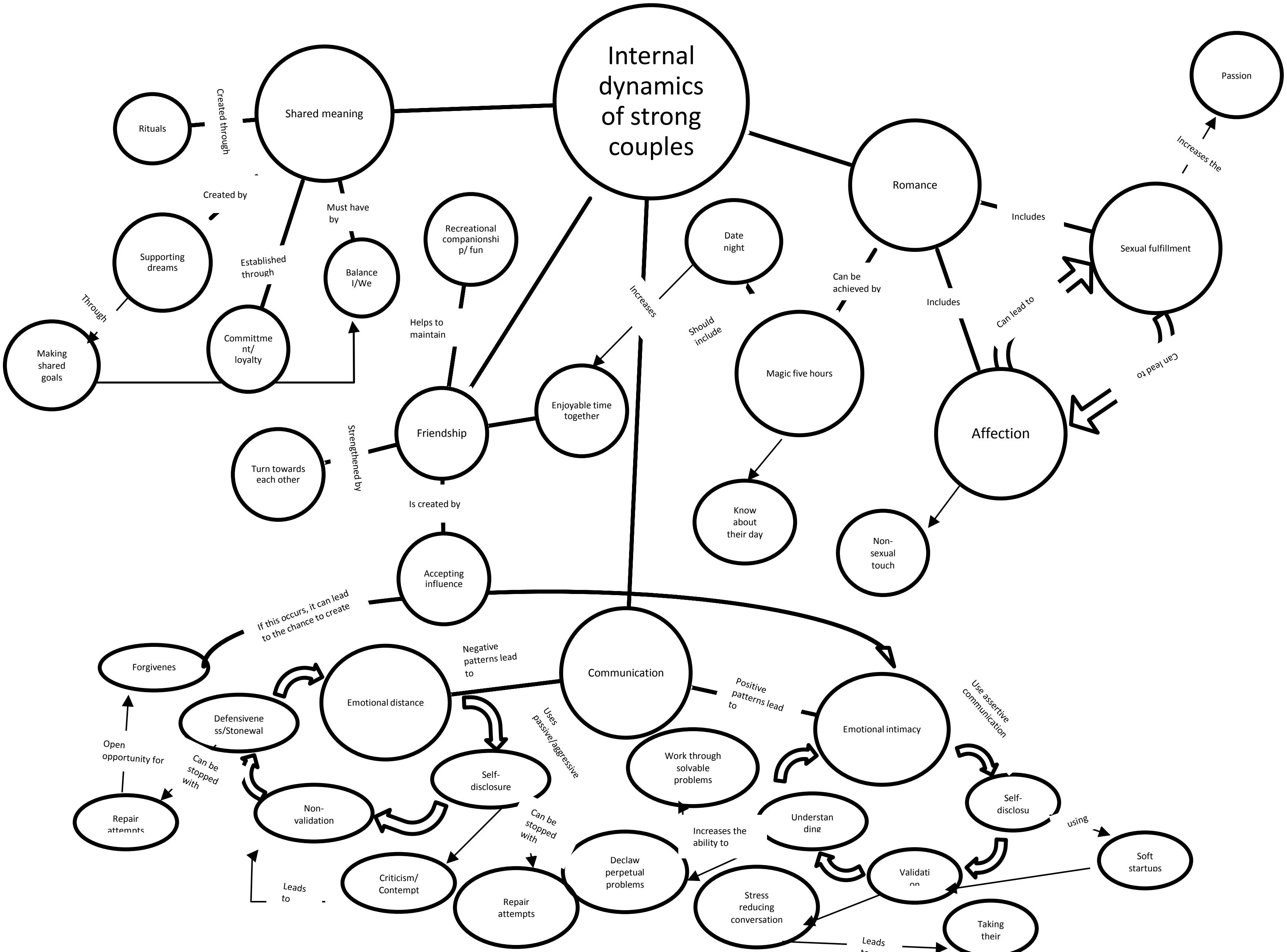

Table 1

Indicators and Examples of Coding Values

Levels	**Indicators**	**Examples**
Level 1: Remembering	Basic Statement	“In every society there are a variety of families.”
	Incorrect definition or understanding of a concept and Incomplete thoughts.	“The styles are the listening cycle, assertive communication, stress reducing conversation, soften up your start up, and make and receive repair attempts.”
	Introductory sentence	“I would like to write about what makes a strong marriage and family compared with what makes a struggling marriage and family.”
	Direct quote	“Cohesion is defined as, “a feeling of emotional closeness with another person.” (Olsen, 2014, p. 91.)”
	Questions	“Were they committed to stand by each other, even when the “feeling” of love was fleeting?”
	Sentences that we were unable to comprehend	“If certain principle is not true, no reward will be found.”
Level 2: Understanding	Compare and contrast without example	“However, there are a lot of similarities to both types of marriages, for example, whether it be a strong marriage or a struggling one, they are both marriage, they both started off with love, and they both include a husband and a wife and may include kids.”
	Basic definitions	“Within communication, there are three main key components: listening cycle, awareness wheel, and love maps.”
	Stating a problem or sentence went in a negative direction	“Every couple is going to have complaints.”
Level 3: Applying	Stating a solution (in simple terms), or moving in a positive direction	“When a family functions cohesively, the relationships among the members are healthy.”
	Problem solving, making a plan	“Having detailed Love Maps helps a couple be better able to have appreciation and affection in their marriage.”
Level 4: Analyzing	Definition with examples	“A couple with a healthy marriage uses assertive communication- not holding back what they are thinking, making sure that their voice is heard,

		standing up for what they want."
	Similar to level 2 with more depth & analyzing	"Every career or position held in life, whether it is a janitor, teacher, CEO, president, or king, will never hold as much significance as the role and responsibilities one has as a member of a family."
	Personal stories tying in concepts	"Our marriage really struggled, our family really had a difficult time working together, and my job began to suffer because I was constantly dealing with one family crisis after another."
	Compare and contrast with specifics	"Although a family and marriage who is extremely close to each other is often seen as a good thing, if it means that it keeps the couple and members of the family from living their own lives and developing themselves as individuals, it's not benefiting the family or marriage and this is when it can lead to a characteristic of them struggling."
Level 5: (Rare) Evaluating	"Light bulb moments" that are usually found within a story, examines and defends, uses concepts, and examples.	"Commitment is the ultimate expression of love, commitment says "even though you are completely scaring me, and I'm not sure where your heart or mind is, I love you, and I am committed to weathering life's storms with you, I am willing to sit here and experience pain, joy and sorrow."
	Analyzes with further evaluation	"Through studying this semester, I have learned that the internal dynamics of a strong marriage and family is not comprised of one linear process but is comprised of intricate and detailed concepts like a spider web with strong web like concepts intertwined and supportive of each other."
Level 6: (extremely rare) Creating	New way of thinking, prediction, theory, uses concepts in a new pattern	"We can only give for the emotional wealth we possess, when each spouse is in possession of a full and bountiful emotional bank account, they find themselves feeling very much in love and want to expand that love, and I firmly assert the notion that sexuality is best experienced in the conditions of a full emotional account."

Table 2

Frequency Counts and Mean Scores of Student Learning Based on Bloom's Revised Taxonomy N = 30

	Pre Concept Map Paper		Post Concept Map Paper	
	Frequency	Percent	Frequency	Percent
Remembering (1)	513	26.8	464	24.7
Understanding (2)	465	24.3	437	23.2
Applying (3)	331	17.3	410	21.8
Analyzing (4)	576	30.1	531	28.2
Evaluating (5)	28	1.5	39	2.1
Creating (6)	0	0	1	.1
	n = 1913 sd = 1.21 x = 2.55		n = 1882 sd = 1.19 x = 2.59	

Table 3

Frequency Counts and Mean Scores of Student Learning Based on Bloom's Revised Taxonomy Two Outlying Participants Removed N = 28

	Pre Concept Map Paper		Post Concept Map Paper	
	Frequency	Percent	Frequency	Percent
Remembering (1)	511	28.3	449	25.7
Understanding (2)	464	25.7	401	23.0
Applying (3)	331	18.3	384	22.0
Analyzing (4)	474	26.4	472	27.0
Evaluating (5)	26	1.4	38	2.2
Creating (6)	0	0	1	.1
	n = 1803 sd = 1.20 x = 2.47		n = 1745 sd = 1.20 x = 2.57	