# The Relevance of Text Structure Strategy Instruction for Talmud Study: The Effects of Reading a Talmudic Passage with a Road-Map of its Text Structure

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ABSTRACT

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This study investigates the effect of access to a visual outline of the text structure of a Talmudic passage on comprehension of that passage. A system for defining the text structure of Talmudic passages was designed by merging and simplifying earlier text structure systems described for Talmudic passages, following principles taken from research on text structure. Comprehension of two passages were compared for students who did traditional reading of a Talmudic passage (the passages had punctuation added, and a list of difficult words and their meanings was appended), (the control condition), and students who read the passage with these same materials as well as with an outline of the text structure of that passage (the experimental condition). Seventy-two 10th and 11th graders participated. After a brief training on text structure, students were randomly assigned to the control or experimental condition for Passage 1. All students took a comprehension exam on Passage 1. In the next session, all students who read Passage 1 in the control condition read Passage 2 in the experimental condition, and all students who read Passage 2 in the experimental condition read Passage 2 in the control condition. Students then took a comprehension exam for Passage 2.

The text structure outline improved students' ability to comprehend Passage 2, but no benefits were seen on Passage 1. The results provide evidence that awareness of the text structure of a Talmudic passage helps readers when the passage is concrete and somewhat well organized.

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# INTRODUCTION

## A Crisis of Talmud Study in Modern Orthodox Schools

Talmud is a discipline that Modern Orthodox (MO) Jewish High Schools are struggling to teach effectively. The need for improved Talmud instruction has come to the forefront as concerns about MO students' level of engagement with religious studies have risen over the past decade (Feuerman, 2009). MO school and community leaders fear the potential consequences of students' frustration with this discipline (Pelcovitz, 2005). Students regularly feel frustrated with this discipline because its challenges keep them from understanding the meaning behind the text. Students find it much more difficult to read and understand Talmudic passages than a passage of a typical narrative or expository text.

In these schools, given that a significant amount of time is spent on Talmud study, teachers hope that their students will become proficient enough in Talmud study to be able to read and explain a Talmud passage independently (Segal & Bekerman, 2009; Zisenwine, 1989). Yet, most students in MO Schools cannot prepare a Talmudic passage independently upon graduation from High School. After spending so much time attempting to achieve a basic level of mastery and failing to do so, students get frustrated with this discipline as mastery seems beyond their reach.

Over the hundreds of years that people have engaged in Talmud study, very little has changed about the way the discipline is taught. In the past, the lack of focus on instructional methodology in a variety of Jewish educational settings went unnoticed because such a

significant amount of time was devoted to Talmudic study in these settings. Even in recent history, in many Jewish educational institutions, the Talmud was studied for several hours a day. Hayman explains that the absence of "formalized pedagogics and didactics…was compensated for by an overarching investment of time and by the sheer quantity of source material being learned (1997)."

In contrast, in contemporary Modern Orthodox High Schools, educational settings that attempt to simultaneously provide an excellent college preparatory education as well as a thorough education in Jewish religious texts, it is crucial that Talmudic study be as efficient as possible.

Talmudic Texts: The Nature of These Texts

The study of the Talmud is an ancient Jewish tradition, and thus is at the core of an Orthodox Jewish education. The Talmud is a collection of Rabbinic writings, which, together with the Bible, forms the basis of the Jewish legal system. The Talmud is a large work, divided into 63 volumes, each volume focusing on a different topic. Each volume is composed of several *Mishnas*, authoritative *Tanaitic* sources, each followed by several *Gemaras*, passages that analyze fragments of the preceding *Mishna*. Each of these passages is highly complex, containing a collection of *Tanaitic* (from 0-200 C.E.) and *Amaroatic* sources (from 200-500 C.E.).

Hayman (1997) so elegantly captures the Talmud's complex and unique nature.

> *It blends the study of Bible, law, ethics, philosophy, and history in a network of interpretive traditions, legal source texts, and popular legends. This variety of content is presented in a textual apparatus which records oral traditions composed over more than*

*a millennium by hundreds of rabbinic scholars; in tens of academies in two countries; and in a range of dialects of Hebrew and Aramaic, according to a wide range of logical criteria and methodologies*.

In Modern Orthodox Schools the Talmud is taught as a regular subject beginning in 6th or 7th grade. In Middle School and in High School, generally 6-10 class-periods are devoted weekly to its study. Although teachers' styles differ, the general method of instruction is very similar to the way it has been taught throughout history. A teacher reads through a *sugya*, a passage of Talmud, thought by thought (a phrase or a sentence or two at a time), reading each one in the Aramaic, and then explaining its meaning. At the end of a passage, the class generally discusses the implications of the entire passage.

Challenges with Talmud Study

It is understood in Modern Orthodox schools and communities that Talmud instruction is difficult and has many challenges. A recent formal investigation as to what those challenges are lays the groundwork to enable a search for solutions and improvements to this area of study. Walfish (2003) lists five major challenges that students face when studying Talmud: (1)foreign language, (2)unfamiliar writing style/mechanics, (3)a differing material & social environment, (4)a complicated logical system, and (5)an unconvincing presumption of authority. A closer look at each obstacle is needed to fully understand what instructional modifications or new programs might be helpful.

The first challenge to studying the Talmud is the language barrier. The Talmud is written in Aramaic. Though Aramaic, a Semitic language, is linguistically similar to Hebrew, a language comprehensively studied in Modern Orthodox High Schools, the language still remains

a challenge for two reasons. One is that despite great familiarity in Hebrew, students are far from fluent even in Hebrew itself. The second reason is that a significant percentage of Aramaic vocabulary differs enough from Hebrew words that even students fluent in Hebrew would be unable to decipher them.

The second challenge is the terse style of Talmudic writing and the lack of punctuation in the text of the Talmud. Each idea simply flows into the next without a break indicated by any typographical cues. As a result, figuring out where one idea or basic unit of meaning ends and the next begins is quite challenging.

The third challenge is that the material and social environment differs from our modern context, causing students to feel disconnected from the text. Gender roles, scientific perspective, and work ethic are a few of the assumptions that differ between the culture of the Talmud's authors and of contemporary Modern Orthodox students.

The fourth challenge that students face is mastering the logical system used in the Talmud to form the basis of arguments, proofs, and conclusions. The fifth and last challenge he discusses is a philosophical one. Students, given their modern educational and societal context, have difficulty accepting that the authority of a text should go unchallenged as religious Talmud students had presumed for hundreds of years. Other scholars (e.g., Abelesz, 2000) note a similar list of problems that Talmud students face.

This first step of identifying the challenges of studying the Talmud is crucial for determining how Talmudic instruction can be shaped to improve the learner's skills. With the challenges known, it is possible to look towards other more established fields of research both in

the realm of reading and classroom instruction for a model of how to address the issues identified.

## The Present Study

Given the nature of Talmudic texts and the challenges that readers of Talmud encounter, students need greater guidance to be able to better comprehend the passages they encounter. The various factors that make Talmud learning so challenging were described earlier (Walfish, 2003). The present study focuses on a solution to at least one of these five factors that make Talmud study so challenging - understanding a text that has an unfamiliar writing style and utilizes foreign mechanics. I will first explain this challenge in more detail, and then describe the solution investigated by this study.

The Talmud is written in a terse style and no punctuation is delineated. Each thought simply flows into the next without a break. As a result, figuring out where one thought ends and the next begins is quite challenging. This feature is what makes the Talmud most different from other texts that students are familiar with and probably poses the greatest challenge for them. Without the basic support and guidance that punctuation usually provides in a passage, Talmud students get lost in a Talmudic passage, known as a *sugya*, not even managing to formulate a basic level of meaning when reading. Students encountering a Talmudic text shut down often because they are too overwhelmed, presumably because they are so far from attaining any sense of coherence as they begin reading through a passage.

Because Talmudic passages are so difficult to comprehend, a strategy to organize the material has significant potential for improving comprehension of the text. Significant research demonstrates that an organizing strategy which pulls the details of a passage into a larger

framework known as text structure- significantly improves readers' understanding of certain texts (Armbruster, Anderson, & Osterag, 1987; Bartlett, 1978; Cook & Mayer, 1988; Englert & Hiebert, 1984; Gordon, 1990; Williams, Hall, Lauer, Stafford, & DeSisto, 2005). In Talmudic texts, where the need for an organizing schema seems even more necessary than for other texts, text structure awareness would seem to be potentially of great benefit. Awareness of a passage's overall structure has the potential to keep the reader focused when reading and to give the reader a schematic structure into which to place all the smaller bits of information, helping the reader avoid a sense of failure and lack of direction.

Awareness of text structure (TS) in general and of particular passages has been shown to be beneficial in a wide variety of expository and narrative texts (Armbruster et al., 1987; Fitzgerald & Spiegel, 1983). Given that the organization of an expository text is quite different from that of a narrative text and yet the research has found that readers of both text-types benefit from TS awareness, it is likely that TS awareness is beneficial in a variety of text-types, in texts that have not been heavily researched yet as well such as Talmudic texts.

Specific parallels between the organization of narrative and Talmudic texts make it even more compelling that TS awareness would be beneficial in Talmudic texts. In both types of texts, there are several higher-level structural parts that for every passage appear in a different order with a different number of parts. The structure of a narrative passage may be classified, for example as, *statement of time, statement of place, introduction to characters, action, emotion, action, action.* An example of the structure of a Talmudic passage is as follows: *statement, question, answer, proof, rejection, proof, answer*. The components of each text-type are different, but the way the components organize into a cohesive whole are parallel. The structure of a passage in each of these two texts is characterized by the order and number that its list of

components appear in. Given that knowledge of this layout of the content organization is helpful in one text, narrative text, it is likely that knowing the organization of a passage would be helpful in the other similarly organized text-type, Talmud.

A further justification that TS awareness has potential in Talmudic text is the collection of studies that have found TS awareness to be beneficial even for texts written in a reader's second language. Because TSS instruction has been found to improve reading of texts in a second language as well (Carrel, 1985; Yeh, Schwartz, & Baule, 2011), it has promising potential for improving reading comprehension for English or Hebrew speakers studying Talmudic texts written in Aramaic.

Modern Orthodox Talmudic students fall within the parameters of the population-types that studies have found benefit most from TSS instruction. The two particular populations that have been found to benefit most from TSS instruction are beginning readers and experienced readers with a particular handicap or challenge- ones with learning disabilities, remedial readers, ones reading difficult scientific texts, etc. Conversely, it has been found that the benefits of text structure are minimized when dealing with simple texts (eg, Taylor & Beach, 1984). Because Talmudic students are both beginner readers, as they have been exposed to these texts for a small number of years, and are readers engaging in very difficult texts, TSS instruction is likely to be very useful to them.

The reason that awareness of text-structure helps students understand the texts that they are reading has been explained to be that having a sense of the underlying structure of a passage enables a person to have a mental model within which to store all the details of the passage and to synthesize and make sense of the disparate parts (Rumelhart & Ortony, 1977; vanDijk &

Kintsch, 1983). In Talmud reading, this would mean that if a reader is unable to understand a particular phrase in a *sugya* because of the foreign language barrier or is unable to figure out the logical argument that is developed, the student still may be able to deduce the meaning of that word or phrase once these pieces are placed within a larger model that he or she understands.

In this context, the Present study investigates the effect of presenting a reader with the text structure of a Talmudic passage outlined in a visually clear manner on the reader's comprehension of that passage. The present study employed a brief type of Text Structure Strategy Instruction just for the particular passage being read. The primary goal of the study was to determine whether the reader's awareness of the text structure of the passage results in better comprehension of the passage as compared to a reader of the same passage who is not aware of the text structure of that passage. A secondary goal was to see if the benefits of the text structure awareness vary with passage-type, Talmud abilities, or general reading abilities.

General Hypothesis

Our hypothesis is that students who read a Talmudic passage with the text structure of that passage mapped out in front of them will demonstrate superior comprehension of the passage when compared to students who read the same passage with no mapping of the text structure accessible to them.

Research Questions

The following questions were addressed in this study:

1. Do students who read a Talmudic passage with the text structure of the passage mapped out in front of them demonstrate superior comprehension of the passage when compared to students who read the same passage with no mapping of the text structure accessible to them?
2. Does the benefit of text structure awareness vary between passages?
3. Does the effect of the roadmap access depend on reading ability, Talmud skill level, or gender?

# LITERATURE REVIEW

## A model of Reading Comprehension with Text Structure Identification as an Essential Element

Reading comprehension is a process that has been actively researched over the last few decades. The work of numerous areas of research together, including linguistics, rhetoric, folklore, artificial intelligence, education, and psychology (Meyer, Young, & Bartlett, 1989) have painted a much clearer picture of a process that had been thought to be unexplainable (LaBerge & Samuels, 1974). A model of reading comprehension introduced by Kintsch and vanDijk (1978) posits that there are two operations that a reader engages in. In the first, the meaning elements of a text, or propositions, are organized into a coherent whole. In the second, the full meaning of the text, or the gist, is conceptualized.

In the first operation, the propositions, the basic units of meaning in any discourse, are turned from a list into a web of interrelated parts. Each proposition is composed of one predicate, or relational concept, and one or more arguments, or agents, objects, or goals. Propositions approximate simple sentences. An average sentence, thus, is generally composed of several propositions. The reader automatically tries to link all propositions, just a few at a time, by finding which propositions have common arguments. The reader continues this process until all propositions are linked to at least one other proposition.

If any propositions do not have argument overlap with any other propositions, the reader initiates inference processes to add propositions which will make the mental representation of the discourse coherent. Inference is the process of filling in the implicit gaps based on general or contextual knowledge of the facts. An actual discourse will always have such gaps given the

convention that an author will not state what is assumed to be known by the reader. In this first operation of reading comprehension in the Kintsch and vanDijk model, the reader turns the explicit (stated by the author) and implicit (filled in by the reader) propositions into a coherent set of ideas or facts.

In the second operation, the reader uses what Kintsch and vanDijk refer to as macro-rules to reduce and organize the propositions into a meaningful whole. Through these rules/steps, the reader represents the same facts but just from a more global point of view. They delete all redundant and unimportant propositions (not needed for understanding other propositions), generalize sets of propositions, and construct ideas that are implied by sets of propositions. The macrostructure that is constructed through this process can then be repeated to form an even more condensed global meaning of the passage. Several levels of macrostructure are possible for every text.

Many other investigators assume the existence of Kintsch and vanDijk's second operation. What Kintsch and vanDijk call macrostructure formation, others call content structure (Grimes, 1975), logical structure (Meyer, 1975), semantic structure (Fredericksen, 1972), gist, and theme (as noted by vanDijk & Kintsch, 1983).

General knowledge of the facts is needed in the second operation just as it is needed in the first operation. In the second operation, the formation of the macrostructure of a discourse, the most important general knowledge includes a set of schematic structures of discourse that the reader is aware of. A schema is a general psychological term that is defined as the framework containing "the network of interrelations that is believed to generally hold among the constituents of the concept in question." A schema, or what others call a frame, functions as a

mental graph containing a certain number of variables or slots related to one another by a fixed set of relationships which a person can fill in with any set of input. The schema constrains how the variables relate to one another, but what each variable refers to differs in each situation. It serves as a "cognitive template against which new inputs can be matched and in terms of which they can be comprehended" (Rumelhart & Ortony, 1977).

A schematic structure of discourse, the general knowledge needed in Kintsch and vanDijk's second operation, likewise, gives a reader a mental graph containing certain variables or slots which text content can be inserted into during reading. It gives the reader a mental framework within which to organize what is read. Schematic structures of discourse, also known as superstructures, compose the set of possible functional structures that any given genre can take on. This knowledge of possible organizational hierarchies, each with its own set of specific variables arranged in a particular manner, helps the reader determine how all the sets of propositions are meant to connect. It guides the reader through the macro-rules in facilitating the macrostructure formation.

The reader tries out the different possible schematic structures similar to how a scientist tries out a hypothesis. The reader picks one schematic structure and evaluates whether the content of the text fits the structure. If it does not, another of the possible structures is tried. This is repeated until the correct schematic structure is found and filled in (Rumelhart & Ortony, 1977). This top-down process (of knowledge of possible schematic structures guiding macro-proposition formation) together with the bottom-up process discussed earlier (of deleting, generalizing, and constructing of all propositions in the text) helps the reader form a mental representation of the major parts of the text.

Although there seems to be a consensus that reading comprehension in general, and macrostructure formation in particular, involve both the bottom-up and top-down processes described above, different investigators focus more on one than the other in their description, analysis, and empirical testing of the process. Investigators who put more emphasis on the bottom-up approach, focus on a reader noting the interrelations between propositions in order to form greater levels of structure until a final top-level is formed that captures the gist. Investigators more focused on the top-down approach, view the key step of the process to be the reader picking from a finite number of conventional structures, a step that will constrain and guide the reader in the right direction throughout the reading process. Which investigators take each approach will be examined in a later section.

What is included in the finite set of schematic structures or superstructures is only briefly referred to by Kintsch and vanDijk. Examples of conventional schematic structures of discourse that Kintsch and vanDijk mention are the structure of a story or a psychological report (1978) and a news article (vanDijk & Kintsch, 1983). Other investigators put greater emphasis on what is included in this set of conventional schematic structures, and the greater role they play in the process. A review of possible conventional schematic structures will be examined in detail later.

It is important to note that this model set out by Kintsch and vanDijk, in its essence widely accepted by other linguists and psychologists, does not include two lower level operations that a reader must first engage in. Although not part of the model discussed here, it is assumed that a reader must engage in decoding, or physically identifying the sounds and phenomes, and determine the meaning of each individual proposition in order to enable the two operations described by Kintsch and vanDijk. These two lower level operations, though just as essential for successful reading comprehension, are out of the purview of this chapter.

For the remainder of this review, I will focus specifically on the second operation of Kintsch and vanDijk's model of the process of reading comprehension. Although it is necessary to carry out the first operation, connecting all the individual propositions, in order to create a macrostructure, the details of the second operation will remain as the focus. There is significant evidence that confirms the existence of this macrostructure-forming process and the crucial role it plays in remembering and understanding the meaning of a text in a wide variety of contexts.

Throughout this review the term *text structure* or *hierarchical organization* will be used interchangeably to refer to the general notion of a higher level structural organization of text without distinguishing between different investigators' conceptions of this organization. The particular terms used by specific investigators will be used when a particular conception of this textual organization is intended. *Macrostructure* and *schematic structure* (also known as superstructure) respectively will be used to specify the difference between the organized content itself and the generic mental framework in which the content is entered by the reader.

VanDijk and Kintsch's model and other researchers' notions of a top-level text structure are collectively rooted in ideas introduced early in the 20$^{th}$ century. Most credit Bartlett (1932) for the notion that a text is composed of large components or building blocks that facilitate encoding and retrieval (e.g., Mandler & Johnson, 1977; Rumelhart & Ortony, 1977). He changed the paradigm of text understanding from being focused on the intrasentenial level to something larger. He described components of style, mood, and class that form the meaning of any text. These components together, he called readers' schema of text. Kintsch and vanDijk and other investigators that will be discussed in this chapter further developed this initial vague notion of schema into very well-defined models of hierarchical organization patterns that exist in text and are used by readers in the comprehension of text.

The psychological rationale for assuming a formation of a higher level organization of a text both in encoding and in recalling that text is rooted in an understanding of the nature of memory. Because a finite number of words, phrases, sentences, or facts can be remembered at once, a person's understanding and recall of a text cannot be a carbon copy of the text itself. Ausubel (1965) describes a subsumption model to explain what is retained in memory. He explains that central ideas, or top-level ideas in content structure, and peripheral ideas, or low level ideas, are both stored in memory, but over time the central ideas subsume the peripheral ideas whose identity is forgotten.

Psychological Validity for This Model

Empirical testing confirmed the important role played by text structure formation in the reading comprehension process, providing psychological validity for the second operation in the Kintsch and vanDijk model. The initial set of findings indicating a reader's sensitivity to a hierarchical organization of a text, or a macrostructure, found a levels effect in text recall. Several investigators found that information higher in the text's hierarchical structure was more frequently recalled than information lower in the text's hierarchical structure (Kintsch & Keenan, 1973; Mandler & Johnson, 1977; Meyer, 1975). These findings implied that readers distinguish between main ideas of a text and the details of that text. Readers, thus, must have constructed a mental model of the macrostructure while reading.

Investigators in a second set of studies reached the same conclusion through a slightly different experimental design (eg, Rice, Meyer, & Miller, 1989). Investigators compared the recall of a particular piece of information in a text where that information was at a high structural level in a passage to a text with identical content at a lower structural level in the passage. The

same levels effect was found. The participants who read the passage that contained the particular information higher in the structural hierarchy recalled that information better than the participants who read the passage with the same information lower in the hierarchy.

A later set of studies provided even greater evidence that readers form a mental representation of the macrostructure of a text and that this mental representation facilitates better memory of text. Readers aware of the author's text structure tended to have better recall of that text than readers who lack this awareness (McGee, 1982; Meyer, Brandt, & Bluth, 1980; Taylor, 1980). Each study involved a similar design but investigated different age groups. One compared 5th graders with high reading comprehension skills to 5th graders with low reading comprehension skills. The other two studies did the same for two groups of 6th graders and two groups of 9th graders. These investigators reported two interesting findings: First, that the competent readers used the author's text structure more than their low reading comprehension peers. Second, they reported, students who used the author's text structure, regardless of whether it was a competent reader or a less competent reader, recalled more than their counterparts who did not use the author's text structure in their recall response. In summary, these studies demonstrated that good readers tend to spontaneously form a macrostructure of the text that parallels the author's text structure and facilitates better memory of the text.

Scrambling studies were a third significant thread in early text structure research that provided psychological validity for the notion of macrostructure formation by readers. Scrambling studies were patterned after a famous study by deGroot (1965, as cited in Davis, Lange, & Samuels, 1988) about memory. DeGroot found that when players briefly memorized a chess-board set-up in a legal configuration, master players had superior recall to novice players. Interestingly, though, when the board was arranged in an unusual, illegal configuration, master

players had no recall superiority over novice players. This finding suggests that better recall occurs when a relevant schema is accessible to a person. The players could apply their chess knowledge to better perceive or retain what they saw when the pieces fit a schema, or an expected set of relationships. When the pieces were not arranged in an expected order, the additional knowledge that the master players had about chess did not alone facilitate memory of what they were shown.

Using a parallel research design to DeGroot, investigators compared the recall of readers of two forms of the same text. They analyzed the amount retained after readers were given a canonical, or unscrambled passage with a non-canonical, or scrambled passage. Canonical means that the components are ordered or connected as expected. In a non-canonical passage, the components are ordered in an unexpected way. Both forms of the text had the same content. The researchers merely changed the order of the information to scramble it. Under a variety of different conditions, readers of unscrambled texts recalled more than readers of the scrambled form (Carrel, 1984; Perlmutter & Royer, 1973; Poulsen, Kintsch, Kintsch, & Premack, 1979; Schultz & Divesta, 1972). Similarly, readers were found to retain more when they read a well-organized passage than when they read a passage that was not as well organized to be in line with the expected convention (Frase, 1969; Kintsch, Mandel, & Kozminsky, 1977; Thorndyke, 1977).

Other investigators, using an experimental design that exactly paralleled deGroot's, checked whether experts would have an advantage over novices in recalling scrambled texts (Taylor & Samuels, 1983). Similar to deGroot's finding about chess players, it was found that $5^{th}$ and $6^{th}$ grade text structure aware participants outperformed text structure non-aware participants only on the canonical text forms, but not on the scrambled ones.

These three threads of research, studies about a levels effect, recall benefits of text structure sensitivity, and scrambling research, together provide strong evidence that readers do indeed form a macrostructure of a text as they read it and/or use it to facilitate retrieval on recall tasks. Most of the studies discussed so far provide clear evidence for one of these two phenomena, but do not definitively distinguish between these two options. It is likely that if an awareness of the text's macrostructure increases recall, the reader also uses that same awareness of the macrostructure when encoding, or comprehending the material. However, it is possible to assume one but not the other. Evidence will be discussed later that demonstrates that readers do both- form a macrostructure as reading, and use this macrostructure during retrieval.

## How to Capture Text Structure: A Comparison of Psychologists' Approaches

In the previous section, the implications of text structure sensitivity were reviewed. In the next section, attempts to train students to acquire and use this awareness of text structure will be reviewed. Before this next body of research is presented, a closer look is needed on what different investigators have in mind when they refer to a text's structure.

Thus, in this section, the full range of notions of text structure that have been taken by psychologists to analyze and represent the organization of information in prose will be described in greater depth. The notions of text structure used by the various investigators in the instructional studies as well as notions of text structure discussed by other psychologists and linguists will be surveyed. It will be explained how this global organization is thought to be constructed by the reader, and how various investigators instructed readers to construct this global hierarchical organization of text. Which investigators trained readers in which variations

will be delineated in the next section, in the summary of Text Structure Strategy (TSS) instructional findings.

Investigators' visions of text structure, the hierarchical organization of text (which competent readers tend to be aware of), can be divided into two categories. Some investigators describe the construction of the hierarchical organization, or the text structure, as a bottom-up process, and others describe it as a top-down process. The bottom-up process is more involved. In the bottom-up process, the reader begins by analyzing the text from the word level, piecing together one layer at a time, in order to ultimately arrive at the global meaning of a passage. The top-down process is one that is based on expectations of what the global structure is likely to be. The predetermined variables or slots of this expected structural schema are filled in with text content to enable the reader to form an overall sense of the semantic meaning of the passage. In the top-down process, the reader generally does not need to go through many layers to arrive at the global meaning of a passage.

In this section, the theories of the bottom-up processes of macrostructure formation will be described first. Kintsch and vanDijk's (1978; vanDijk & Kintsch, 1983) text processing model, discussed at length in the first section of this paper, is an example of a bottom-up process of macrostructure formation. In this model, the reader begins by parsing a passage into its constituent propositions. Next, the reader attempts to connect all the propositions to other propositions. The connections between those propositions are identified by finding common arguments between propositions and accessing general knowledge that explain how yet other propositions are connected. Finally, the reader reduces and organizes these interrelated propositions by generalizing (identifying sets of propositions which convey particular ideas),

deleting any propositions that are unimportant, and restating other propositions or sets of propositions. Through this multi-step process, a reader constructs the macrostructure of the text.

In representing this hierarchical organization Kintsch and van Dijk use numbered nodes to represent propositions and lines to indicate connections between propositions. One other thing that Kintsch and van Dijk indicate in their visual mapping system is the number of times a particular proposition was analyzed. The number of boxes around each node indicates this number.

Meyer (1975) uses a similar model to Kintsch and van Dijk. In her model, text structure construction follows a similar multi-step process of a) proposition identification, b) identification of relationships between the propositions, and c) organizing the propositions into sets and identifying the relationships between the sets. Step (a) for Meyer and Kintsch and van Dijk are almost identical, as their definition of a proposition is similar. Steps (b) and (c) are quite similar in their goals but Meyer has a much more precise and explicitly delineated process that a reader follows to accomplish steps (b) and (c).

For step (a), they both use a similar form of case grammar to parse the passage into its constituent parts, propositions. The system that they each use is a variation of Fillmore's (1968, as cited in Meyer, 1975) case grammar. Each proposition is composed of a lexical predicate and one or more arguments. A lexical predicate, also known as a relational concept, is a word from the passage, most often a verb. Arguments are other words from the passage that are related to the lexical predicate by one of several possible relationships. An agent, or the one performing an action, is one type of possible relationship. Other relationships that can connect a lexical predicate and its arguments include roles like instrument or patient. An instrument is an object

that enables the actor that is mentioned, and a patient is the object that is affected by the action done.

For step (b), identifying the relationships between propositions, Kintsch and van Dijk explain that the reader identifies argument overlap between propositions. Any proposition that has an argument, or content-word, in common with another proposition is considered to be connected to that proposition. The nature of the relationship between any two propositions, though, is not specified. Meyer has a more detailed process for identifying connections between the propositions. Step (b) for Meyer, involves connecting propositions with a particular set of descriptive labels.

These descriptive labels that connect different propositions or sets of propositions are called rhetorical predicates. This labeling system is based on the work of Grimes (1972, as cited in Meyers, 1975). Before the work of Grimes, linguistics had been focused entirely on the intrasentential system of parsing. The rules that govern the makeup of a sentence were highly studied and developed. Grimes added a new dimension to text parsing by describing the intersentential organization, or the organization of text beyond the sentence level. Meyer, adopting this system of rhetorical predicates introduced by Grimes, notes that there are three types of rhetorical predicates: paratactic, hypotactic, and neutral. Paratactic rhetorical predicates have at least two arguments of equal weight. Hypotactic rhetorical predicates, in contrast, have one argument that is subordinate to the other. Neutral rhetorical predicates can take on either of the other two forms depending on the author's emphasis.

Step (c) for Meyer is similar to Kintsch and vanDijk's third step. In step (c), they both describe that the reader reduces and organizes the propositions into sets of propositions to enable

formation of a coherent and global gist of the text. For Kintsch and van Dijk, this is done through a relatively vague process facilitated by what they call macro-rules, where the reader generalizes, restates, and deletes. For step (c), Meyer describes that a reader repeats the same process that was done in step (b), relating the various components with rhetorical predicates for the formation of as many layers needed to construct the global overall hierarchical structure. Each layer's set of propositions are successively further condensed into larger and larger groupings of propositions by use of the same list of rhetorical predicates.

To represent this model of hierarchical organization, Meyer, just like Kintsch and van Dijk, uses nodes to represent propositions and lines to indicate connections between them. The most significant difference between their visual representations of the text structure is the additional labels that are included to describe the connections in Meyer's graphs. In Meyer's tree structures, in addition to the words written in capital letters which indicate words in the text, words written in lower case letters function as labels. These labels describe the relationship between two words, propositions, or sets of propositions. Within a proposition, the labels are generally role relationships like agent, instrument, or patient. Between propositions or sets of propositions, the labels are generally rhetorical predicates.

There are other more minor differences to their representation systems. For example, as noted earlier, Kintsch and van Dijk indicate how many cycles of processing are done for each proposition. Meyer does not include this information in her representation of text structure. Meyer also includes details that Kintsch and van Dijk leave out. For example, in Meyer's structure trees, a distinction is made between relationships that the author emphasizes with explicit description by using a double line and relationships that are implicit by using a single

line. This distinction is not indicated in Kintsch and van Dijk's visual representation of text structure.

Fredricksen (1972) has a third model of how a reader constructs the global organization of a text via a bottom-up process. Fredricksen's first step of the global organization of the text is the same as Meyer's and Kintsch and van Dijk's step (a). Fredricksen uses a similar adaptation of Fillmore's case grammar to identify all the propositions of the passage. The next steps in Fredricksen's model are similar to the two previous models discussed, as they are intended to reduce and organize the information in the text. The process, however, is significantly different from these previously discussed models. For Meyer and for Kintsch & van Dijk, steps (b) and (c) attempt to capture the hierarchical organization used by the author to communicate the gist of the passage. In Fredricksen's model, on the other hand, the reader constructs the conceptual gist of the passage, not the author's intended gist or hierarchical organization.

Crothers (1973, as cited in Meyer, 1975) uses the same general model as Fredricksen, but one that is even more conceptually based than Fredricksen's model. Instead of using case grammar to parse propositions into their constituent parts, he instead uses only conceptual criteria even to parse the passage into its most basic constituents. These two variations of a conceptual model of parsing will not be explained in detail here since there is no evidence that either of these conceptual representations is actually constructed by readers, nor that this representation benefits readers (Meyer, 1975).

Spencer (1973) has a fourth representational model of the global organization of a passage. This fourth model attempts to construct the gist of the passage communicated by the author as do the first two models discussed. This model is most similar to Meyer's model in that

the ideas in the passage are organized by a fixed set of relationships. It is not as complete, however, as the parsing systems used by Meyer and by Kintsch and van Dijk. Spencer's model explains how a reader connects all the ideas in a given paragraph, but does not explain how all the propositions connect to one another.

In Spencer's model, the basic constituents are classified based on the function of each idea. The function of a given idea is determined by asking the questions- who, what, when, where, how, and why. Spencer has a list of nine functions that answer different questions. Ideas that would fall under the *what happens unit,* for example, answer the questions: who did it? to what? and what was done? Ideas in the *modifier unit,* answer the question: what kind? Other categories include the *where unit* and the *when unit*. Through this system, all the basic components in a text are classified and categorized within their respective paragraphs.

Although some psychologists focus their models on bottom-up approaches to reading comprehension, and others focus on the top-down approaches, all appear to agree that reading comprehension combines both approaches to some extent. Meyer (1975) explicitly states that a reader or researcher can parse a text either way. Even Kintsch and van Dijk, though they clearly believe that the bottom-up approach is the primary reading comprehension process (Kintsch, 1988), they include a top-down approach occurring simultaneously to the bottom-up approach in their model. They note that schematic structures, or known overall organizational frames, of a particular text-type, guide the macro-rules (step c) of macrostructure formation. Thus for Kintsch and van Dijk, for whom reading comprehension is fundamentally a bottom-up process, expectation driven processes still play a role. Though investigators frame their approaches to reading comprehension differently, each investigator does not choose a model that is completely

bottom-up or top-down. Rather, each puts more emphasis on one or the other in their systems of prose analysis and in their empirical studies.

Meyer is one of the psychologists that describe a top-down approach of reading comprehension and macrostructure formation in addition to a bottom-up approach. In instructional studies, she trains students only in the top-down approach, presumably because it is a more efficient process. She describes a top-down approach to reading comprehension across texts.

Meyer explains that the same process of reading comprehension that she describes as a bottom-up process can also take place in the reverse order. A reader or researcher could process the text in either direction. To process the text through top-down parsing, a reader would just reverse the order of the steps described above. First, the reader would engage in step (c), identifying the schematic structure of the passage into which the propositions are grouped and organized. Then the reader would engage in (b), determining how the meaning at the top-level can be parsed into smaller chunks. Step (b) would be repeated for as many layers as needed to "reach the desired level of specificity" (Meyer, 1975). Step (a), proposition identification, would often not be necessary in order to get the gist and main ideas of a passage.

Since the key step to top-down processing is the identification of the top-level schematic structure, investigators focused on the top-down process look closely at the set of possible schematic structures for text. Meyer, Brandt, & Bluth (1980) speak of five common hierarchical organizations, or text structures. They are description, sequence, causation, problem/solution, and comparison. These hierarchical organizations are five of the eighteen rhetorical predicates that Meyer (1975) adapted from Grimes (1972) as the list of possible connections that can exist

between propositions or sets of propositions. These are the five higher order relationships that Meyer et al. found empirically to appear in text most frequently.

Problem/solution, also known as response, is one type of paratactic rhetorical predicate, or an organization with two equally weighted arguments. Description, or attribution, and comparison, or adversative, are both types of hypotactic rhetorical predicates. Hypotactic rhetorical predicates describe a structure containing one superordinate argument and other subordinate arguments. Sequence, or collection, and causation, or covariance, are both types of neutral rhetorical predicates, texts that can be classified as either paratactic or hypotactic depending on the author's emphasis of the arguments. Niles (1965) (as cited in Bartlett, 1978) gives a similar list of common text types with slightly different terminology. His list includes enumerative order (description), time order (sequence), cause-effect (causation), and comparison-contrast (comparison).

These five hierarchical structures can capture the text of almost any genre. The reader just needs to identify which one a particular text has, and to mentally represent the content of the text within that structure. A reader can choose which one of these five organizational patterns best fits the organization of the passage being read based on the signaling, or cues that the author gives, and on the content of the passage. A person can then read the passage in light of that schematic structure, parsing the top-level ideas to fit the schematic structure

For each of these conventional structures identified by Meyer et al. (1980), a text can be represented mentally by a particular outline. For a text that is organized with a problem/solution hierarchy, for example, the outline would look as follows: The words *problem/solution* at the top would diverge into two large sub-topics: *problem* and *comparison of solutions*. Under

*comparison of solutions*, the various solutions described in the passage would be entered by including the title of each solution, a description of each solution, and a cost-benefit analysis of each option. Under the word *problem*, two other large sub-topics would emerge: *description* and *cause*. In *description*, content of the passage that elaborates on the problem would be entered. Under, *cause*, information about what led to the problem would be included (Meyer, 1999).

Meyer & Freedle (1984) note that although texts theoretically can contain only one of these higher level structures, most texts in actuality are combinations of at least two of these. Folktales, for example, contain description, causation, and collection with an overall problem/solution or comparison organization. Thus, readers not only need to identify one top-level structure when reading a passage, but often two or three for any given passage. Readers then need to fill in each of the top-level structures identified from the content of the passage.

Another top-down method for comprehending and analyzing a passage of any genre is hierarchical summarization. Hierarchical summarization does not describe a set of schematic structures as Meyer et al. did, but describes one generic organizational system that can capture the meaning of any text. Taylor (1982), working with Kintsch & van Dijk's model of reading comprehension, points out that when there is a genre-specific schematic structure to guide the macro-rules in forming the macrostructure, the reader utilizes that particular schema. Hierarchical summarization is useful in particular when there is not a genre-specific schematic structure available. Hierarchical summarization serves as "the general outline of ideas in a particular expository text to form a macrostructure for the text that retains the main ideas of the text in the correct sequence" when no more specific schematic structure is available.

Hierarchical summarization means that the reader makes a skeletal outline of the passage that notes every heading, subheading, and paragraph. This general structural schema based on the punctuation, indents, and section-titles of a passage are then to be filled in by the content of the passage. The reader writes a summarizing statement for each of the components in the outline based on the semantic content of the passage.

Hierarchical summarization schemas are represented by a set of numbers and letters. A roman numeral is listed for every section designated by a heading. A capital letter is written for every subsection designated by a subheading. An arabic number is listed for every paragraph within a subsection. This outline that is created based on the surface structure of the text, represented with numbers and letters, serves as a schematic structure for any text to which the content of the passage can be entered.

Meyer et al. (1980) and Taylor (1982) describe methods of top-down prose analysis that capture the higher level structure of any text. Unlike Meyer et al. and Taylor's systems of top-down prose analysis whose systems work across all texts, other psychologists have described top-down schematic structures that describe the top-level organization of particular genres. Schematic structures have been suggested for narrative text, news articles, and experimental reports. For example, there are particular expected schematic structures suggested for narrative text that are not transferrable to expository text, and particular expected structures for experimental reports that would not be expected for a news article.

Story grammar is a schematic structure for narratives in particular that has been well-developed. Rumelhart (1975) explains that every story consists of a *setting* and an *episode*. A *setting* is defined as a statement of time and place and an introduction of the main characters. An

*episode* consists of an *event* and a *reaction* by the protagonist. An *event* is an action that a person carries out, a simple change of state, or another episode. A *reaction* is the main character's overt or internal response which can include an emotion or a series of actions or attempts to carry out a specific desire or plan. Other researchers have similar story schematic structures of narrative text (Mandler & Johnson, 1977; Stein & Glen, 1979). Schank and Abelson have a similar narrative schematic structure to Rumelhart, but have more of a bottom-up approach to the macrostructure formation (Rumelhart, 1975). All these story grammar varieties are adaptations of Propp's (1968; as cited by Rumbelhart, 1975) analysis of Russian folktales.

A specific schematic structure or superstructure has been described for newspaper articles as well. Van Dijk & Kintsch (1983) call it the relevance structure. A newspaper article, they explain, is organized by how important or relevant the information is. It begins with the most important information in the *headline*. Specifically, it notes what the topic is and summarizes the macrostructure. In the *lead*, the article summarizes and introduces the information that will follow in the body of the article. The next global component of a news article is an *event* category. In this component, the events constituting the "news" are related in order of importance. Three other categories or components are *previous information*, *context*, and *background* which respectively address prior information which is needed to process the particular event, the category or nature of the event, and the conditions that made this event likely.

Others have similar descriptions of the schematic structure of news or journalism articles. Neal and Brown (1976) point out that journalism articles are structured in an inverted pyramid. A journalism article opens with the *lead*, or most interesting finding. The second constituent is *qualifications* or *amplifications* of the lead. A third component is the *background* needed to

understand the lead. A final component is information that is left over after the first three sections, called *secondary information* (Neal & Brown, 1976).

A schematic structure for experimental reports, or what others call research reports has also been described. Davis, Lange, & Samuels (1988) describe a superstructure for experimental reports which they call the Vesonder model, named after its creator G.T. Vesonder. The top-level constituents of this model are the *problem* to be investigated, a *description* of the investigation, the *results* of the investigation, and a *conclusion*. Others describe the schematic structure of these reports in a similar way using the terminology used by the American Psychological Association guidelines for the sections of experimental reports (Barnett, 1984). With the guidelines of the APA (1974), the text is divided into *introduction*, *method*, *result*, and *discussion* sections. Each of these sections can be further divided into subsections. Barnett gives an example of how a *method* section contains other components: descriptions of the *subjects*, *materials*, and *procedure*.

In the next section, as text structure instructional studies are reviewed, it will be specified which of these notions of text structure each investigator employed in the text structure training.

## Text Structure Strategy Instruction

Text structure strategy (TSS) instruction research emerged from the work of investigators reviewed earlier in this chapter. The three sets of studies in the section called *psychological validity* provided a strong rationale for teaching readers the importance of macrostructure formation and explicitly delineating the steps of the process. It was hypothesized that readers would benefit from instruction in strategies that mature readers use spontaneously (Oakhill & Garnham, 1988). In TSS training, also known as TSS instruction, readers are taught to keep the

overall structure of the text in mind, and to use this overall structure as a retrieval mechanism as well.

Building on the rationale stated in the previous sections, investigators examined whether TSS training of this type would improve students' recall and comprehension of texts. The benefits of TSS training have been investigated in a variety of populations and a variety of text-types.

In this section, the body of research on TSS instruction will be reviewed, paying particular attention to the following:

a) Which text-types are benefits found for?
b) How is Text Structure defined by each investigator?
c) Which populations have benefits been found for?
d) What forms of TSS Instruction have led to benefits for readers?
e) Do the benefits differ for Primary Language and Second Language learners?

The range of options for question (b) was discussed in the previous section. In this section, the identification of how the text structure is defined will be briefly mentioned, but the description of each type will not be repeated. For a full description of each option, refer to the previous section.

Findings in Narrative Texts

Some of the first attempts of TSS training were in identifying and using the hierarchical structure of narrative texts. The structure of narrative texts, of folktales, fables, and myths in particular, were initially given most attention because of their regimented organization. Because

these text-types had been transmitted orally for many years, the higher level organization of their constituents is relatively simple and constant from one story to the next (Mandler & Johnson, 1977). Training in story grammar, a system which describes the hierarchical relationships of narratives, was found to be beneficial for weak readers (Buss, Ratliff, & Irion, 1985; Fitzgerald & Spiegel, 1983; Gordon & Braun, 1982). It trains readers in a top-down text structure processing method, focused on an expected schematic structure for narrative texts in particular.

In a study done by Fitzgerald and Spiegel (1983) on this type of TSS instruction, fourth grade average and weak readers were assigned to one of two treatments: story structure instruction or dictionary usage and word study. Story structure instruction involved multiple training sessions. In the first set of instructional lessons, instructors introduced participants to one story element per session and went through examples of that story element in sample narratives. In the later lessons, participants engaged in a variety of exercises to apply the new structural knowledge including re-organizing stories according to these structural categories and creating stories from loose sentences according to the learned structural categories. The dictionary usage and word study treatment group received the same amount of instruction, but focused on word definition and usage instead. Participants in the story structure treatment group performed significantly better on a reading comprehension measure than participants in the other treatment group.

Findings in Expository Texts

Though some early TSS instructional studies involved training in reading narrative texts, the bulk of TSS instructional studies have involved training in reading expository texts. Many investigators noted the greater relevance of TSS instruction for expository texts. Students at

almost all grade-levels read almost entirely expository texts in school (Armbruster, Anderson, & Ostertag, 1987). Reading strategies are particularly important for expository texts because of the great challenge that these texts pose. While narrative texts are generally composed of familiar temporally ordered events, expository texts generally contain unfamiliar content and are characterized by complicated abstract relationships (Williams et al., 2005).

I will now review the benefits of TSS instruction for use with expository texts. The studies will be organized by the age of the population studied. First, studies about readers in the primary grades will be described. Second, studies about high school readers will be presented. Finally, studies with college students and older adults will be discussed.

*Readers in Grades 4-9.* Several investigators looked at the effect of TSS training of early readers (grades 4-5) in expository texts and several others looked at the effect of the same training on somewhat older students (grades 6-9). In these studies, the typical experimental design involved structure training that was conducted for several weeks in the students' regular classrooms. Structure training in these studies involved direct instruction about text structure and practice with identifying text structure on grade level passages, generally social studies passages. The dependent variables in these studies were text recall and/or comprehension. The improvement on posttests (after reading an age-level text) was compared for a TSS training group and a conventional reading comprehension training group. A conventional group involved reading passages, answering questions on those passages, and discussions about the passages and questions. It was meant to replicate the reading instruction in a typical primary school classroom. In some studies a control group with no instruction was included as well.

Although the experimental design was very similar across studies of this age group, how each group defined 'structure training,' differed. Three general definitions of text structure were used by various investigators at this age level: two top-down text structure identification strategies and one bottom-up text structure identification strategy.

One of the text structure training programs was training in what the investigators called *mapping*. Mapping is a bottom-up processing strategy that is supposed to lead to a mental representation of the higher level organization of a text. This mapping procedure is a more simplified variation of Kintsch and van Dijk (1978) and Meyer's (1975) bottom-up parsing procedures. A map is a "graphic representation of the superordinate and some of the more important subordinate ideas in a passage" organized in a similar way to how the author organizes the ideas in the passage (Berkowitz, 1986).

In a study that involved mapping training, sixth grade students were assigned to one of two experimental groups or to one of two control groups: map-construction, map-study, question-answering, or re-reading. In the two experimental conditions, students were taught either how to create their own maps of texts or how to use a map of a text that they were given. In the control groups, students spent the same amount of time answering questions about passages, or getting extra time to read over the passages that the students would be tested on. The students in the map-construction group had significantly better recall of text after the training as compared to each of the three other groups. This finding, however, was only true when the students classified as expert readers of each group were compared. In this study, the training was not effective for weak readers nor was it effective for readers who used maps that a researcher constructed for them (Berkowitz, 1986). Others found similar results for 8$^{th}$ graders (Armbruster & Anderson, 1980, as cited in Armbruster et al., 1987).

Another type of TSS training investigated with students in 4th-9th grade was hierarchical summarization, one type of top-down text structure analysis method. In hierarchical summarization, the reader makes a skeletal outline of the passage that notes every heading, subheading, and paragraph, and writes a summarizing statement for each of those. Taylor (1982) found that 5th grade students who received training in hierarchical summarization had better recall than students who received conventional reading comprehension training. Taylor and Beach (1984) found that 7th grade students who received training in hierarchical summarization had better recall than students who received conventional reading comprehension training (review of passage and questions), but only on unfamiliar passages. This type of TSS instruction, however, was not found to increase scores on short answer questions on those same passages.

A third type of Text Structure training that was investigated with elementary and middle school students was the top-down prose analysis procedure described by Meyer et al. that involves the teaching of what they posit to be the five most common schematic structures of expository text. It does not involve a whole outlining and parsing procedure that is meant to work across text-types like hierarchical summarization and mapping. Instead, the training for any of these five structures, involves learning a set outline which is the same for every passage of its type which is meant to be filled in with content from any text. The hierarchical outline that is learned only contains a few categories that are always connected through the same set of relationships, and have specific words and phrases associated with each one that cues the reader to identify which text-content fits in which section of the outline.

In this third type of TSS training, participants are introduced to one or several of these five hierarchical structures and the associated outline. Participants are also given the opportunity

to practice identifying these structures in passages and filling in the outlines with content from the passages. This type of TSS training is the one that has been most studied. Because this type of prose analysis has been described at length by Meyer and her colleagues in several publications, it is the most easily replicable type of TSS training.

Armbruster et al. (1987) examined the effects of this third type of TSS training on students in the primary grades. Fifth grade students were randomly assigned to one of three groups: TSS training, conventional training, or a control group. In the TSS training, students were taught strategies for outlining a problem/solution passage. Students in the TSS training group did significantly better on two measures of social studies text comprehension and recall of passages with problem/solution structure after training. They outperformed the two other groups on responses to an essay question and recall of the important details of the passage. Other investigators found similar effects for ninth grade students (Bartlett, 1978; Leon & Carretero, 1995).

Interestingly, it was found that benefits of TSS training of one of the five conventional schematic structures of expository text transferred to texts with different conventional structures. This finding, however, was limited to recall of signaled texts, or texts that contained words explicitly cueing the reader into the text structure, and only to recall of the macrostructure of the text (Leon & Carretero, 1995).

Using the same definition of text structure (Meyer et al.'s list of 5 conventional expository texts), but a different experimental design, Slater, Graves, and Piche (1985) demonstrated that students benefit from even a very brief training in TSS. In this study, the TSS training involved only one page of reading. Ninth grade students in the TSS training condition

read in this page about a) the benefits of text structure awareness, b) a description of the structure of one particular conventional schematic structure that matched the structure of the test passage, and c) an example outlining the structure of a particular passage with that schematic structure. Students who received this training, and were given a grid outlining the structure of the test passage, outperformed other ninth grade students who did not receive this training including ones who did have the same grid of the test passage available to them during reading. They outperformed both of these other groups on recall and comprehension measures. In summary, benefits for text recall and comprehension have been found in three different types of TSS instructional studies for students in grades 4 through 9.

Similar benefits have been found for even younger students as well. A TSS instructional program for at-risk 2nd graders was developed both for compare/contrast passages (Williams et al., 2005, 2009) and for cause-effect passages (Williams et al., 2007). Classes who were assigned to this treatment (TSS instructional program embedded within the regular curriculum) outperformed classes who were assigned to the regular curriculum without the TSS instructional program on some comprehension measures. Benefits have been demonstrated for TSS instruction to 2nd graders in guided reading groups as well (Hall, Sabey, & McClellan, 2005).

More recently, TSS instruction has been shown to be effective with elementary school students through a new modality- a web-based tutoring system. 5th graders who received TSS instruction through a web-based tutoring program, improved their use of the text strategy and improved their recall of ideas from the text (Meyer et al, 2002, Meyer & Wijekumar, 2011).

*High School Readers.* Although most high school students are proficient readers and thus text structure instruction would presumably be irrelevant, investigators predicted that TSS

instruction might be useful for struggling High School readers. Weisberg and Balajthy (1989) used a similar experimental design and definition of TSS training as Armbruster et al. (1987). High School students placed in a remedial reading class were randomly assigned to a strategy or conventional instruction condition.

Students in the strategy condition received direct instruction about one of the conventional text structure types, compare/contrast. Students were taught how to recognize signal words cuing compare/contrast information and received explicit rules and modeling for constructing graphic organizers and writing summaries. In the training sessions, students practiced applying these strategies in 12 social studies passages, and received feedback on their work. The conventional instruction group had the same amount of instructional time. They read and discussed passages, but did not discuss text structure strategies. One month after training, all participants read two passages.

There was a statistically significant difference between the two groups on all three dependent measures: quality of graphic organizers, quality of text summaries, and scores on the comprehension test on the two passages. The strategy group, however, only had better comprehension scores on one passage, the familiar one. The scores on the unfamiliar passage did not significantly differ between the 2 groups.

*Adult Readers.* Others found similar benefits for adults using TSS training for particular conventional structures. Cook and Mayer (1988) found that college students benefited from formal training in TSS as well. Participating college juniors were randomly assigned to either a TSS training or control condition. The TSS training condition involved eight hours of instruction and practice in sorting passages into categories based on text structure, as classified

by Meyer et al. The control condition involved eight hours of reading instruction and activities unrelated to text structure. Students with the TSS training did significantly better on some of the recall and comprehension measures of Biology passages which they read. The same results were seen with adults across a large age range, outside of a college setting (Meyer, Young, & Bartlett, 1989). A group of young adults (mean age of 24) and an older group of adults (mean age of 67) who received TSS instruction had higher recall and comprehension of main ideas on a set of 15 different passages than did their counterparts in a practice group who practiced reading passages and answering questions on those passages but did not discuss text structure at all. Enhanced recall was also found for college students in a remedial reading course who received TSS training (Balajthy & Weisberg, 1990).

Other investigators examined the effects of TSS training in another conventional text structure, the global organization of scientific articles. Samuels et al. (1988) investigated the effects of what they call "experimental report grammar" training on text recall of college students. They randomly assigned college juniors enrolled in a psychology course to either the TSS training condition or to a condition which had no structure training. They found that the group of students who read and memorized TSS training material recalled significantly more than the group of students who did not receive any TSS training.

This study does not only differ from many of the others in its definition of TSS training, but also in the venue of the training. The TSS training in this study was much less involved than the training in most of the other TSS studies. No instructor was involved and significantly less time was dedicated to TSS training. Participants assigned to TSS training received an eight page structure training booklet which explained how awareness of text structure could assist with comprehension and recall. It described the function of each part of a journal article as well as its

subcomponents. Participants in the TSS training condition read and memorized the components of a typical journal article.

Summary of TSS Instructional Studies

In summary, investigators have found benefits for TSS instruction in reading both narrative texts and expository texts for readers as young as first grade to older adults. In narrative texts, one type of text structure has been defined and tested in all studies- story grammar.

In expository text, a variety of conceptions of text structure have been investigated. Most of the bottom-up conceptions of text structure have not been investigated. In the one study in which it was investigated, benefits were found to be limited. In contrast, benefits have been found consistently across ages and across reading abilities for top-down methods of prose analysis, mostly in the TSS instruction introduced by Meyer and her colleagues. A small number of studies have also demonstrated benefits for two other top-down conceptions of text structure: hierarchical summarization and experimental report grammar.

It seems reasonable that training in top-down methods of prose analysis would be beneficial to readers. TSS that involves the teaching of a specific set of conventional schematic structures of text gives readers a more specific schema within which to represent a given text. It makes sense that reading would be more efficient when readers begin the reading process with a specific set of expectations of how the content will be organized. Interestingly, though, the expectation-driven reading that has been demonstrated to be very helpful is not limited to highly specified expectations, like the five conventional structures with associated graphs introduced by Meyer and her colleagues, or story grammar or experimental report grammar, but is also true for

readers with more general sets of expectations about text organization. Hierarchical summarization, a more general top-down method of prose analysis, has also been found to be effective in improving reading comprehension.

Bottom-up parsing, though it has been shown that it can lead a reader to the top-level structure of a text, may be either too involved for a reader to engage in to be helpful, or too complicated to learn in a limited training program. Alternatively, it is possible that it is helpful, but that the experimental design of these instructional studies was flawed. It is possible that some bottom-up parsing methods of determining a text's structure would be beneficial if instructional programs teaching this methodology were adjusted and improved. That question can be addressed by further research.

Various types of instruction are possible for any given TSS. Most instructional studies involved several hours of training over the course of a few weeks, which involved direct instruction on the components of the given text structure, practice applying the instruction to several passages, and feedback from the instructor. Some of the instructional programs included additional learning activities and methodologies.

It is important to note, though, that even some very brief instructional programs were found to be beneficial. However, in one of the brief instructional programs, participants in the TSS group received an outline to use while reading test passages. This additional piece of scaffolding may have been necessary to compensate for the brevity of the training program (Slater et al., 1985).

## The Role Text Structure Plays for Other Populations and Genres

### TSS Instruction for Second Language Learners

A few studies have replicated some of the experimental designs discussed above on readers engaged in second language learning. Because of additional challenges to reading a text in a second language, it cannot be assumed that text structure strategy instruction would be as effective. When reading a text in a second language, readers have three additional challenges to reading in a primary language: a) more working memory resources are needed, b) words from two languages are activated simultaneously, and c) a more limited vocabulary in the second language is available as a resource (Yeh, Schwartz, & Baule, 2011).

Despite the differing nature of reading in a second language, these readers were generally found to gain similar benefits from TSS instruction. Intermediate College French students had better recall of French passages after reviewing materials about text structure than their counterparts who did not review these materials (Davis et al., 1988). These French students received only brief self-guided instruction in TSS for scientific articles. Intermediate College French students also had better recall of problem/solution French passages on post-tests after several TSS training sessions as compared to their counterparts who had the same number of sessions practicing reading problem/solution passages and learning study-strategies (Raymond, 1993).

Students learning English as a second language (ESL) also were found to have better recall on English passages after receiving TSS instruction (Carrel, 1985; Yeh, Schwartz, & Baule, 2011). The primary languages of these ESL students included Spanish, Chinese, Arabic, and a variety of other languages. Carrel (1985) adapted the text structure training program used

by Bartlett (1978) for instruction of ESL students, and Yeh et al. (2011) adapted the text structure training program used by Meyer et al. (1989) for ESL students. Both of these training programs for ESL students involved several training sessions about common top-level structures used by authors including description, causation, and problem-solution. A combination of frontal teaching and student practice and feedback were used to familiarize participants with these top-level structures and prepare them to use it in reading and recalling text. In the control groups, instruction involved a variety of linguistic activities including grammar and vocabulary lessons as well as reading and writing assignments based on the same passages that were read by the TSS training group.

Although the number of studies on the convergence of TSS instruction and second language learning is small, there is strong evidence that the benefits of TSS instruction for reading in a primary language are similar for people reading in their second language despite the additional challenges faced by second language learners. Some even suggest that TSS instruction would be even more crucial for second language learners than for people reading in their primary language. Because TSS instruction facilitates better recall and comprehension by increasing space in working memory (Yeh et al., 2011), TSS instruction would help overcome one of the challenges noted to be a particular obstacle in second language learning, limited working memory to hold all the new vocabulary, and thus may be even more beneficial for second language readers.

The Text Structure of Talmudic Texts

Earlier in this paper, it was explained that text structure in prose has been defined in multiple ways by a variety of investigators. In this section, the various ways that the structure of the Talmud has been defined will be reviewed.

A Talmudic passage, often referred to as a *sugya* (Segal &Bekerman, 2009; Zisenwine, 1989), cannot be broken down into clearly demarcated sub-sections as most expository and narrative passages can. A *sugya* is defined as the literary unit of discourse. It can range from a few thoughts to a few pages (Kanarek, 2000). A *thought* will be referred to throughout this paper as an idea unit which can be as short as a phrase or as long as two to three sentences. A *thought* is the smallest unit that makes a particular point. Each sugya can be broken down into several thoughts, the most basic conceptual unit in a sugya, but the thoughts generally cannot be chunked together easily. This is in clear contrast to the propositions in expository passages that are grouped together to form larger conceptual units using any one of several chunking methods- hierarchical summarization, mapping, or the conventional set of common rhetorical structures. None of these chunking methods are possible in a *sugya*.

The Talmud jumps from one thought to the next rather than organizing several thoughts into one paragraph, as an expository text does. Reisner (1996) explains what may have led to this seemingly dysfunctional structure. Each sugya is composed of thoughts from three different source-types- Tanaitic statements, Amoraitic statements, and anonymous commentary on these statements. The term *Tanaitic* describes sources that originate from the time period of 0-200 C.E., and *Amoraitic* describes sources that originate from the time period of 200-500 C.E.

Because these different historical layers combine to form one text, the text it forms is not holistic and not well organized into larger sub-sections.

Despite being a different type of text, Talmudic passages can still be divided into discrete parts. Just those discrete parts do not fuse together to form larger parts. Talmud instructors have outlined different types of discrete parts into which a Talmudic passage can be parsed.

All passages of Talmud are composed from a limited set of discrete parts, called *logical components* by some (Lehman, 2002) and *structural elements* by others (Segal & Bekerman, 2009). There are a total of 5 to 10 types of logical components- depending on how you classify these discrete parts. Different instructors and researchers have experimented with a variety of classifications.

Lehman (2002) in a self-reflection study describes the list of logical components she uses in her teaching: *quote, amoraic argument, prooftext, challenge, refutation, clarification, question, answer, resolution,* and *story*. A software program developed for Talmud instruction called GemaraBerura uses the following alternative list: *opening source, development, question, difficulty, contradiction from another source,* 2 answer-types, *support*, and *conclusion*. In both of these classification systems, each logical component is usually about one phrase or sentence long, though can be as long as three sentences at times.

Many Talmud instructors, though by far not most, are beginning to try to use a list of logical components in their teaching, but there is no standard list used by instructors. Lehman and GemaraBerurah, as well as many Talmud instructors use a short list of logical components that all contain *question, challenge, proof,* and *answer* as four of the components, but the complete list varies in each case. Many of the lists of Talmudic logical components in current

use are thought to be helpful based on instructor and student feedback, but no list has been systematically tested for efficacy.

The nature of most expository texts differs from that of Talmudic texts, and therefore, the macrostructure or higher level meaning of the text must be represented in different terms. In most expository texts, ideas are developed through the fusion of many smaller units, or propositions. One idea is often communicated through several sets or layers of propositions. In the Talmud, ideas are stated abruptly in very few words, and there is little development of those ideas. An idea can be made up of one proposition, or at most from a handful of propositions. Thus, the top-level chunks are much smaller and less-developed than the top-level chunks in other expository texts.

Aside from the magnitude and complexity of each individual chunk, there is another significant difference between expository texts in general, and Talmudic texts in specific. Another difference between most expository texts and Talmudic texts is in how the chunks fit together. The top-level structure of most expository passages can be described by demonstrating how the larger well-developed chunks relate to the whole, and how each large chunk relates to the other large chunks. The top-level structure can be captured in a graphic presentation of the parts connected to one another by lines, called by some a node/line map (Kintsch & vanDijk, 1978), and by others a tree structure (Meyer, 1975). There are several trees or node/line maps that can describe the top-level structure of most expository texts: description, sequence, causation, problem/solution, and comparison (Meyer, Brandt, & Bluth, 1980). Each of these descriptions of top-level structure explains how all the parts relate to one another.

A clearer demonstration that expository text structure is composed of parts that are highly interconnected can be seen by looking at an example of one possible expository structure, a comparison. A passage can be described as a comparison if two opposite ideas are described and similarities and differences of the two are noted. One large chunk in the passage runs in parallel to another large chunk that states an opposing idea. A chunk that describes a similarity between those two ideas connects the two chunks with the specific function of showing how they are similar. Another chunk may be in the passage connecting the two chunks of opposing ideas, noting how the two ideas differ from one another. Each chunk within the passage has a clear relationship to every other chunk and to the whole. The first two chunks mentioned run opposite to one another. The last two chunks mentioned run in parallel to one another and each connect the first two chunks.

The connection between each of the parts is clear in expository passages, in comparison passages as well as passages with the other top-level structures described by Meyer, Brandt, & Bluth (1980). See Appendix A for an example of a problem/solution, reproduced from Meyer, 1999. In this diagram, the relationship between each of the chunks can be seen.

In contrast, in Talmudic texts, the top-level structure of passages cannot be explained by the relationship between chunks and the whole, and by the relationship of chunks to one another. Rather, in Talmudic texts the top-level structure explains the role of each basic part or chunk, and how each chunk relates to the chunk that precedes and follows it. The overall organization, therefore, can be described as a particular chain, a list where it is clear how each part connects to the adjacent two parts, but not as a node/line map or a tree-structure that explains the connections between all the parts. In the structure of Talmudic texts, connections are not necessarily made to organize non-adjacent parts together.

Though Talmudic texts also differ from narrative texts in regards to chunk size and chunk complexity-level, as the chunks in a Talmudic text are much simpler and smaller and are not fusions of more basic parts, the way that the top-level structure of narrative texts has been described is a better model for how to describe the top-level structure of Talmudic passages. The top-level structure of narrative passages are described by listing the roles of the large chunks that compose a particular story, not by describing the relationship between the chunks themselves, as is done in describing the top-level structure of most expository texts. As a result, the top-level structure of narrative texts looks much more like a list, and much less like an interconnected set of parts. See Appendix B, reproduced from Mandler & Johnson, 1977, for an example of a diagram of the top-level structure of a narrative text. Each chunk does not necessarily have a clear relationship to every other chunk in the passage.

The schematic structure of a Talmudic text is most similar to the structure of narrative texts. In both, there are several roles or functions that the higher-level structural parts can take on in a passage. The text structure of any given passage is a list of the functions that the top-level chunks take on in that passage in the order that they appear.

The text structure of each genre is similar to a phone number. Each place-holder in the phone number can be one of nine digits. Each digit can appear in any of the seven spots, and can appear anywhere from 1-7 times. The difference between the text structure of narrative texts and Talmudic texts is what those parts (or digits) are. Just like in a phone number, in the top-level structure in narrative texts and Talmudic texts the order and function of the chunks is listed, but the connection between the various chunks is not noted.

In a given narrative, the largest chunks of content can take on several of finite functions: *statement of time, statement of place, introduction to characters, action, change of state,* and *emotion* (Rumelhart, 1975). A given story can take on the following top-level structure, for example: *statement of time, statement of place, introduction to characters, action, emotion, action, action.* Another story may take on the following structure: *statement of place, introduction to characters, statement of time, change of state, action, action, change of state, action, action*. In the top-level structure of a narrative, the functional components belong to a finite set of components, but the number of each component, and the order they appear in differs from story to story. Though the terminology for each investigator of story grammar differs slightly, this point is the same for all story grammar classifications.

For the Talmudic structure, the same is true regardless of which investigator's terminology is used. Using Lehman's (2002) terminology, one Talmudic text may have the following top-level structure or list of functions that the chunks take on: *quote, challenge, amoraic argument, prooftext, clarification*. Another Talmudic text may have the following top-level structure: *quote, challenge, resolution, story, question, answer, refutation*. Regardless of which investigator's terminology is used, each Talmudic text's top-level structure is composed of a subset of the finite possible structural Talmudic components or functions, and the number of each component, and the order they appear in differs from one Talmudic *sugya* to the next.

The classification of the top-level structure of Talmudic texts is also similar to the classification of the top-level structure that has been used for experimental reports and journal articles. The top-level structure of these texts does not describe how the various chunks relate to one another, but instead lists the functions of the chunks of these texts. There is a finite number of functions that a chunk in these texts can take on. For experimental repots, the chunks can

take on the following roles: *problem*, *description of investigation*, *results*, and *conclusion* (Davis, Lange, & Samuels, 1988). For journal articles, the chunks can take on these other roles: *lead*, *amplification*, *background*, and *secondary information* (Neal & Brown, 1976).

In conclusion, given the nature of Talmudic passages, it makes more sense to describe the top-level structure of the Talmud as a list of functions that the chunks in that particular passage is composed of in which the connection between one chunk and the chunk before and after it is clear, but interconnections between all the chunks and between each part and the whole is not delineated. The chunks do not all interconnect. This classification system more closely mirrors the classification of the top-level structure of narrative texts, journal articles, and experimental reports, than the classification of other expository texts.

# METHOD

## Design

Participants in 6 different classes read two Talmudic passages and took a comprehension exam on each passage. Participants within each class were randomly assigned to one of two conditions: control or experimental for Passage 1. All participants were assigned to the other condition for Passage 2. All participants who read Passage 1 in the control condition, read Passage 2 in the experimental condition and vice versa.

## Participants

87 students from one Modern Orthodox High School in the Northeast were recruited to participate in the study. The administration agreed to choose 6 Talmud classes from the High School grades to participate in this study. The school administration determined based on scheduling preferences and administrative concerns which 6 of the 12 Talmud classes in the High School would participate. Each class had between 15 and 20 students. All students in those six classes who returned a signed consent form participated.

Data on the gender, age, Talmud report card scores, and reading ability were obtained from the classroom teachers and from the administration. Talmud report card scores are a composite score that reflect the same thing that most report card grades do, scores on assessments of the understanding of the content learned, skill acquisition, and effort level in that particular class. This score is determined by the student's Talmud teacher that year, just as History and English report card scores are determined by the student's History and English teachers that year. The reading ability of the students was determined by the reading

comprehension subtest of the verbal section of the Comprehensive Testing Program (CTP), administered by Educational Records Bureau (2011). These data were analyzed to confirm that there was not a significant difference between the subjects in the two conditions on any of these characteristics.

## Materials

Materials that were distributed to participants include 2 original Talmudic passages, 2 difficult word-lists, a road-map of each passage, a key to each road-map, and introductory materials to Talmudic road-maps. Aside from the original Talmudic passages, all materials were designed by the researcher.

### 2 original Talmudic passages

Both passages were taken from the Vilna Shas publication of Tractate Sanhedrin. One passage was taken from Sanhedrin 18a-18b (the last 9 lines on bottom of 18a & 4 lines at top of 18b). The other passage is an excerpt from Sanhedrin 20a (the last 12 lines). This publication was chosen because it is the standard publication of the Talmud used in Modern Orthodox High Schools (*Raam, Talmud Bavli*, Sanhedrin).

These particular passages in the tractate of Sanhedrin were carefully selected to fit the four following criteria:

1. *Has not already been covered in the school's Talmud curriculum.*
2. *Contains a variety of the six structural components.*

   They each contain 5 of the components.

*3. Requires only a small amount of background knowledge: no more than one outside source beyond basic Jewish and Talmud knowledge*

One requires familiarity with one Biblical verse and the other requires familiarity with one Tanaitic source.

*4. They are relatively short, but not too brief (120-160 words), as this is a typical length for a sugya studied by High School students.*

The researcher developed a classification of passage difficulty based on word frequency. (See Appendix C.) The word-difficulty level of each passage was calculated based on this 2-tier word classification system. Easy words include the three following categories of words: all Hebrew words (defined as words whose roots appear in the Hebrew English New Dictionary), proper nouns, and all forms of the 100 most common Aramaic words. Frequency counts are based on Tzvika Kanarek's "Talmud Bavli Word Frequency List." For all words not available on the list, the Mechon Mamre exact-word search engine is referenced. All other Aramaic words that appear less frequently than these (less than 763 times in the entire Talmud) are considered Hard Words.

Word frequency is a useful measure because the more frequently words appear, the more familiar Talmud students become with these words. Talmud students learn the meaning of words that come up in each *sugya* they study. The more *sugyas* that have a particular word, the greater the chance is that the students have come across this word and its definition in previous study. Thus, the probability that they recognize a particular word roughly correlates with the frequency it appears. Based on word frequency, the two passages chosen are equivalent in difficulty-level, $\chi 2$ (1, N=287) = 1.77, $p$=0.18.

A photocopy of the page containing the chosen *sugya* was distributed to all participants with two adaptations. The first adaptation is a demarcation of the beginning and end of the *sugya*, the portion the participants are asked to read, indicated by brackets. The second adaptation is the insertion of punctuation. Each passage contains periods, commas, exclamation marks, and question marks. This was done so that the control condition would roughly approximate a traditional Talmud class.

In a traditional Talmud class, the instructor helps the students punctuate the passage and explain the words. In an attempt to portray the goings-on of a typical Talmud class, Segal and Bekerman explain that "the teacher reads the text aloud in discrete syntactical units with strong inflection, and the students repeat after him, unit by unit (2009)." In a typical Talmud class students will often punctuate the words and phrases in their copies of the Talmudic text while the teacher reads the words in this manner.

2 difficult-word lists

The word-list for the first passage contains 19 Hebrew and Aramaic words/phrases translated into English, and the word-list for the second passage contains translations of 23 words and phrases. All words classified as Hard Words in the previous section, are translated on these lists. Some of the less well-known Hebrew and frequent Aramaic words are translated on these lists as well. Any word or phrase that appears multiple times in the *sugya* is translated only once.

A road-map of each passage and a key to the road-map

The road-map or visual outline of the top-level structure of the passage consists of a set of symbols representing the six structural components found in the Talmud with the words of the

Talmudic passage superimposed onto these symbols. (See Appendices D-E for the road-map of the two passages. See Appendices F-G for translated road-maps of the two passages.) The six components are *Statement, Question, Answer, Proof, Rejection,* and *Response* (though no Statements appear in these two particular passages). There are many possibilities for the top-level structure of a Talmudic passage because these components can be combined in any order with any number of each component. A representation of the text structure of a Talmudic passage describes in what order (and how many of each of) the six components appear in a particular passage.

This set of six components is a simplified version of Lehman (2002) and Gemara Berurah's larger sets of structural components. For this study, this simpler list is used in order to limit the number of components that could possibly be classified in multiple ways. With a more limited list of logical components, it is less likely that a particular phrase or sentence can be classified as either of two components. In Lehman's list of components, for example, both a *challenge* and a *refutation* are included. What one person may call a *challenge*, another may call a *refutation*. Thus, a shorter list of components reduces the amount of overlap between each one, and creates a clearer classification system that can be employed in future studies.

Three Talmud scholars independently classified these two passages with this classification system and came to similar conclusions as the researcher; only 2 types of discrepancies were noted between them. The first discrepancy between certain scholars' parsing and the researcher's parsing was that two of the scholars at times subdivided a component into a *statement* and *proof* or *response* and *proof* while the researcher classified those same thoughts respectively as solely a *statement* and solely a *response* considering the proof to be encompassed within the preceding *statement* or *response*. The second discrepancy seen on classifying one of

the two passages was what 2 scholars and the researcher called a *question* and an *answer*, another researcher called a *rejection* and a *response*.

In passage 1, the major classification of each component (ie- assuming no subdividing) and the flow of the passage (ie-which earlier component each given component was building on) resulted in 100% agreement by the scholars on 6/12 components, and at least 75% agreement from the scholars on 10/12 components. See Appendix H.

On the second passage, the classification done by the 3 Talmud scholars and the researcher were almost all identical (leaving aside cases of subdivisions). There was 100% agreement on the major classification of each component and on the flow of the passage. On this passage, there were again just a handful of occasions where some of the scholars subdivided certain components into the component named by the researcher and a *proof*. See Appendix I.

The text structure of Talmudic passages was presented to students in a visual format that was shown to be relatively self-explanatory through earlier pilot studies. Since the instructional component of the text structure strategy is quite brief (only 1 session), a self-explanatory system was crucial. The text structure of a Talmudic passage, as defined above, presented through this visual format, will be referred to as a *road-map* throughout this paper, as it serves as a guide to the reader of a Talmudic passage.

A *question* is represented by a yellow diamond. An *answer* is represented by a blue rectangle. A *proof* is represented by a gray scroll. A *rejection* is represented by a red 'x' connected to a red rectangle. A *response* is represented by a green check connected to a green rectangle. All components are connected by arrows to show which thought connects to which. (A triple arrow indicates an unrelated comment.) (See Appendix J for a full legend.)

The key of each road-map lists the symbol for each component for reference at the top of the page and lists the order that the structural components appear in summary-form at the bottom. (See Appendices K-L.) The road-map together with the key/legend shows the overall outline of a given Talmudic passage (which components appear and in what order), and also which phrases of the passage are part of which structural component.

Introductory materials to these Talmudic visual outlines

A legend noting the symbols for each of the five structural components in these passages was distributed to all the participants (see Appendix J). The other materials that were given to the participants during the introductory session are 2 passages written by the researcher in a similar style and with similar mechanics as a Talmudic passage, but written in English. These were given to the participants so that they could learn and practice the visual outline system before beginning the test passages. One passage is an analysis of a girl's favorite color and another is an analysis of which season it is (See Appendices M-N.). This introductory session was conducted before sessions 2 and 3 to enable participants to interpret the road-maps that they would be given for use in the experimental condition.

## Measures of Comprehension

The measure of a participant's comprehension is the score on a test taken after reading each of two Talmudic passages. A test for each passage was administered immediately after preparation of that passage.

The test on the first passage is composed of 11 multiple choice questions (the number of answer choices for each question ranges from 2 to 6). Only one answer choice is correct for each

question. Each question is worth 1 point each and no partial credit is given for wrong answers. Thus, a student's score could range from 0-11.

The test for the second passage contains 3 sections, each section containing different question-types. The first section has 7 multiple choice questions, each with 4 answer-choices of which only one is correct. The second section has 3 questions in which answer choices have to be chosen from a bank, but each answer-choice can be used more than once, and any question can have up to 3 correct answer-choices. The third section has 3 true/false questions. Thus, this exam has a total of 13 questions. Because each question is equally weighted, and no partial credit is possible, scores can range from 0-13 points.

Both tests contain a main idea question, i.e., a question that tests for understanding of the overall gist of the passage. Both tests also have questions that check for understanding of details in the passage.

## Procedure

This study used a simple experimental design with students in each class randomly assigned to two groups: in the first group, students read Passage 1 in the control version and Passage 2 in the experimental version. In the second group, students read Passage 1 in the experimental version and Passage 2 in the control version. In the control version, the participants read each passage with the difficult-word list in front of them. In the experimental version, subjects read the passage with the difficult-word list in front of them, but also with the road map of the passage (and a legend of the symbols). During reading/preparation time, students were expected to read the passage, look up any words that they do not understand on the

difficult-word list, and re-read any lines they need to until they understand the entire text. Students were allowed to take notes to help them prepare, but were not required to do so.

For each passage, the individual student is the unit-of-analysis. The dependent variable is the score on the reading comprehension test.

The study was conducted in 3 sessions (45 minutes each) during the students' regular Talmud class, spread over a maximum of two weeks. Each session took place in the students' regular Talmud classroom. Each class that participated in the study met separately on its own class-schedule. The researcher conducted the first of the 3 sessions in each class, as the first session has a large instructional element. The last 2 sessions were conducted by the regular teacher, or proctor when the teacher was absent. Since they involved only distribution of materials and dictation of words and short instructions, it was not necessary for the researcher to be present for those latter sessions. Each proctor or teacher followed the identical protocol listed here for each class he/she proctored the study for. This 3-session procedure was the same for all 6 classes that participate in this study.

Protocol for Session 1

During the first period of the study for each class, the participants will be introduced to the idea of a road-map of a Talmudic passage, as defined in this paper. The students will each be given a legend that shows how each of the five structural components will be represented visually. (See this legend in Appendix J.) The proctor will read through the legend out-loud. Then, students will be given one passage written in English in similar format to a Talmudic passage and will be asked to identify what component each text-segment is, and what arrows are needed to connect the various segments in each passage (Betty's favorite color; see Appendix

M). After the students work on this task for five minutes, the proctor will review the correct answer on the board, explaining it while drawing it on the board. Students will be given a chance to ask the proctor questions to clarify any confusion that remains about why any text segment was assigned one particular symbol or another. This procedure will be repeated for the second passage in English, patterned after a Talmudic text (The Season; see Appendix N).

Protocol for Session 2

In the second session, the difficult-word list for Passage 1 will be distributed to all the students. The proctor will dictate the meaning of each word/phrase on this list and students should record the meaning. (Students could ask the proctor to repeat anything they miss.) For one phrase, not only will the hard words be individually translated, but the full phrase will be explained as well. This will also be done for any Biblical verse that is quoted, since it is a quote from a context the students are unfamiliar with and so will not have a means to figure out the full verse on their own.

After all the students in the class are given a chance to record the meaning of all the difficult words, the students will be randomly assigned to the control and experimental conditions. All students will receive the original Talmudic passage (including the accompanying Mishna) with punctuation, and will continue to keep access to the difficult-word list. The students in the experimental condition will also receive a road-map of the passage together with a key of the road-map.

Students will be given 12 minutes, which is the typical amount of time it takes the average student to read that Talmudic passage. It is important that subjects are given just that amount of time to read the passage because the control condition is designed to approximate

regular Talmud reading, and the experimental condition is designed to read a passage under similar circumstances merely with an additional piece of scaffolding. We determined that 12 minutes was the appropriate amount of time in earlier pilot-runs. During earlier pilot-runs where students were given unlimited time to read this passage, a substantial number of students started looking around the room after 12 minutes, indicating that they had had enough time to read through the passage. Students will be given 13 minutes for the comprehension exam, to allow for a full minute to carefully consider each question with all its possible answer-choices, as well as to quickly glance back at the passage to find the answers (but not enough time to re-read the entire passage as well).

Protocol for Session 3

In the third session, the procedure of session 2 will be repeated, with two differences: a) The materials will differ, as the word-list, passage, and road-map will be those designed for Passage 2. b) Students who read Passage 1 in the experimental version will read Passage 2 in the control version, and vice versa.

## Analysis

A mixed factorial design was used to measure the treatment effect on both passages combined. A 2x2 ANOVA with one within subjects factor (condition) and one between subjects factor (group) was conducted to analyze the effect of the treatment on the comprehension score. In addition, a one way ANOVA was used to test the treatment effect on Passage 1 alone and another one way ANOVA was used to test the treatment effect on Passage 2 alone. Additional analyses were done to test for moderating variables and to analyze the effects of individual questions on the comprehension exams.

# RESULTS

## Overview

First, information concerning the characteristics of the participants is presented as well as a brief description of the statistical tests used to analyze the data. Then come the results of the effect of road-map access on comprehension, first, the effect on the passages combined, then on the two passages independently analyzed, and finally on individual test questions. The section concludes with the investigation of moderating effects.

## Characteristics of Participants

There were 87 students who participated in the study. Most students who participated were present for all 3 sessions, but due to illness and other absences from school, several students who participated missed one or more sessions. The score of any student not present for all 3 sessions was excluded. The second reason that a participant's score was excluded was if the reading ability information was not available (CTP scores). After excluding the scores of participants for those two reasons, the number of participants who were included in the study was as follows:

For Group A, which read passage 1 (Sanhedrin 18a-b) in the control condition and passage 2 (Sanhedrin 20a) in the experimental condition, there were 35 participants. For Group B, which read Passage 1 in the experimental condition and Passage 2 in the control condition, there were 37 participants.

Table 1 shows the gender, age, and reading ability of the participants for each passage. Reading ability was measured using the reading comprehension subtest of the verbal section of the Comprehensive Testing Program (CTP), administered by Educational Records Bureau.

No significant differences were found for gender, age, or reading ability between the two experimental groups. No significant differences in the proportion of males and females was found between the Group A subjects, who were in the control condition for Passage 1 and in the experimental condition for Passage 2, and the Group B subjects, who were in the experimental condition for Passage 1 and control condition for Passage 2, $\chi 2$ (1, N=72)=1.07, $p$=0.30. The overall mean age of the subjects across both groups was 15.9 years ($SD$=0.51), with the oldest student being 17.3 years old and the youngest student being 14.9 years old. No significant differences were found between Groups A and B in age, $t$ (70) =0.39, $p$=0.70. The overall mean reading ability, as measured by the reading comprehension subtest of the CTP exam, across groups was 374.35 ($SD$=17.88). The highest CTP score was 399 and the lowest score was 319. No significant difference was found in the mean reading ability between Group A and Group B, $t$ (70) = -1.11, $p$=0.27.

Table 1

*Characteristics of Participants*

| | All participants | | Group A | | Group B | |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | M | SD |
| Gender | | | | | | |
| Male | N=45 | | N=24 | | N=21 | |
| Female | N=27 | | N=11 | | N=16 | |
| Age (years) | 15.90 | 0.51 | 15.90 | 0.57 | 15.90 | 0.46 |
| CTP score | 374.35 | 17.88 | 376.74 | 16.41 | 372.08 | 19.11 |

*Note*. Group A= Passage 1 read in control condition, Passage 2 read in experimental condition; Group B=Passage 1 read in experimental condition, Passage 2 read in control condition.

## Data Analysis

The dependent measure, score on the comprehension exams, was analyzed in the context of a repeated measures 2(Group A vs Group B) X 2(experimental vs control) analysis of variance (ANOVA), with the within-subjects factor being the condition, experimental or control, and the between-subjects factor being the order of the conditions that the subjects read each passage in, Group A or Group B. One group read Passage 1 in the control condition and Passage 2 in the experimental condition (Group A), while the other group read Passage 1 in the experimental condition and Passage 2 in the control condition (Group B). The score on the comprehension exam was the proportion of answers correct.

In addition to the repeated measures design that focused on the effect for the passages combined, the effect of condition on comprehension score on each exam was also analyzed separately for each passage in a one way ANOVA. All tests were based on a Type I error probability of .05. Other analyses were done to understand the effect of condition on score on

particular types of questions on the same exam. The Mann Whitney U was chosen for these analyses due to the small number of test questions in some categories.

Moderating effects of the treatment condition were analyzed with additional one way ANOVA's, each with one covariate to test for the interaction terms in question. In these ANOVA's the dependent variable was the score on the comprehension exam, and the independent variable was condition. The covariate for each was the moderating variable in question.

## Treatment Effects on Comprehension

### Passages Combined

The first research question asked whether access to a road-map (a visual guide to the structure of a passage) while reading a Talmudic passage leads to improved comprehension of that passage compared with reading the same Talmudic passage in the usual manner without this type of scaffolding.

The results for the comprehension exam for the passages combined indicated that treatment was a statistically significant predictor of comprehension exam scores, with participants with access to a road-map outperforming participants in the control condition on average, $F(1, 70)=9.96$, $p=.002$. For the mean scores, see Table 2. For the ANOVA Table, see Table 3.

In this study, participants who read Passage 2 in the experimental condition would possibly have greater benefits from the road map given that this was their second time reading a Talmud passage and taking an exam on it. Consequently, the interaction between the two factors

was analyzed, to account for a possible order effect. The interaction term condition*group was not significant, F (1, 70)=.00, p=.997. The results indicate that the treatment effect was statistically equivalent for both groups (for the group that had practice and the group that had no practice), and that the benefits of the access to a road-map were no greater when given in the second testing session than the first. For a graphical representation of the data, see Figure 1.

Table 2

*Condition Means for Each Passage and Passages Combined*

| | Control | | | Experimental | | |
|---|---|---|---|---|---|---|
| Passage # | n | M (SD) | 95% CI | n | M (SD) | 95% CI |
| Passage 1 | 35 | .58 (.16) | [.53, .64] | 37 | .60 (.19) | [.53, .66] |
| Passage 2 | 37 | .52 (.16) | [.46, .56] | 35 | .66 (.20) | [.60, .74] |
| Combined | 72 | .55 (.16) | [.51, .59] | 72 | .63 (.20) | [.58, .68] |

Table 3

*Repeated Measures Analysis of Variance of Comprehension Exam Score by Condition, Passages Combined*

| Effect | *df* | *SS* | MS | F | *P* |
|---|---|---|---|---|---|
| Condition | 1 | 0.25 | .25 | 9.96 | .002** |
| Condition x Group | 1 | 0.00 | .00 | 0.00 | .997 |
| Error | 70 | 1.77 | .03 | | |

**p<.01

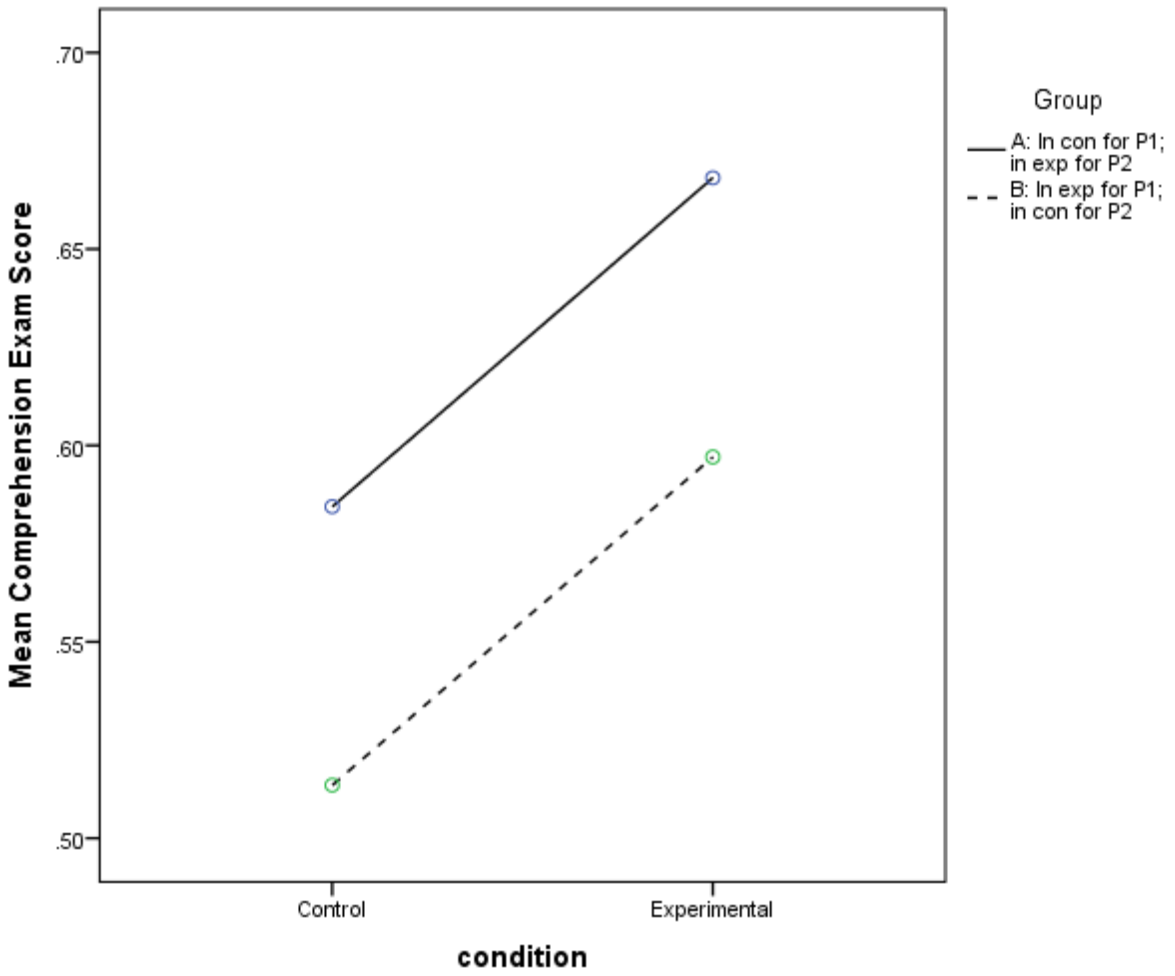


*Figure 1*. Results of repeated measures analysis of variance for the passages combined. This graph shows the mean exam score of the 2 groups in both conditions.

Comparison of Results for Passage 1 and Passage 2

The second research question examined whether the benefits of access to a road-map varies between different passages. The results indicated that the benefits do indeed vary between the two different passages examined in this study.

The results from the ANOVA that analyzed the scores on the comprehension exam for Passage 2 alone indicated that treatment was a statistically significant predictor of comprehension exam scores, with participants with access to a road-map outperforming participants in the control condition on average, $F(1,70)=13.54$, $p=.000$. In other words, the road-map improved participants' comprehension of Passage 2. For the ANOVA Table of Passage 2, see Table 4. Because the Passage 2 ANOVA did not meet the requirement of equal variances the analysis was repeated using the Mann-Whitney U. Results replicated those of the ANOVA, indicating that the mean score of the participants in the experimental condition was higher than their counterparts in the control condition, $U=341.50$, $p=.001$.

The results from the ANOVA that analyzed the scores on the comprehension exam for Passage 1 alone, by contrast, indicated that treatment was not a statistically significant predictor of comprehension exam scores, $F(1, 70)=0.09$, $p=.765$. In other words, the road-map did not improve participants' comprehension of Passage 1, when Passage 1 is considered alone. For the ANOVA Table of Passage 1, see Table 5. The results from these two tests together demonstrate that the access to a road-map had benefits for reading comprehension on Passage 2, but not on Passage 1.

Table 4

*One-Way Analysis of Variance of Comprehension Exam Score by Condition, Passage #2*

| Source | *df* | SS | MS | F | *p* |
|---|---|---|---|---|---|
| Between Groups | 1 | 0.43 | .43 | 13.54 | <.001*** |
| Within Groups | 70 | 2.22 | .03 | | |
| Total | 71 | 2.65 | | | |

***p<.001

Table 5

*One-Way Analysis of Variance of Comprehension Exam Score by Condition, Passage #1*

| Source | *df* | SS | MS | F | *p* |
|---|---|---|---|---|---|
| Between Groups | 1 | 0.00 | .00 | 0.09 | .765 |
| Within Groups | 70 | 2.23 | .03 | | |
| Total | 71 | 2.231 | | | |

Individual Test Questions

The above analyses demonstrate that access to a road-map has benefits for comprehension of Talmudic passages, at least in certain circumstances. To explore the nature of the benefits of the treatment effect, the scores on various sets of questions on the comprehension exams were analyzed. The questions were divided into three sets or clusters of questions. Each question-type tested for a different level of passage-mastery. The first set tested just for identification of the main idea and no further understanding of the details. The second type of question tested for understanding of one idea unit (defined as one box/component or consecutive boxes/components on the road-map) - generally equivalent to one or two sentences, while the third type tested for understanding of multiple idea units. See Table 6 for details on the question-types.

Table 6

*Categories of Question-Types on the Comprehension Exams*

| | # of Questions | |
|---|---|---|
| Question Type | Passage 1 Exam | Passage 2 Exam |
| A. **Main Idea** Question | 1 | 1 |
| B. Checks for understanding of **one idea unit** | 7 | 7 |
| C. Checks for understanding of **multiple idea units** | 3 | 4 |

The score on the questions of each category were tested for significance with the Mann-Whitney Test because of the non-categorical nature of some of the clusters. On the Passage 1 Exam, a significant difference between conditions was observed on the Main Idea Question, but not for the other types of questions. In contrast, on the Passage 2 Exam, a significant difference between conditions was observed on the questions that tested for details. However, on Passage 2 there was not a significant difference between conditions on the main idea question. The median scores per condition on each cluster of questions and significance levels are shown in Table 7. For a full listing of the treatment effect on each individual question, see Appendices O-P.

Table 7

*The Effect of Condition on Success on Particular Question-Types*

| | control | | experimental | | | |
|---|---|---|---|---|---|---|
| Question-Type | median | range | median | range | *U* | *p* |
| A (main idea) | | | | | | |
| Passage 1 | 0.00 | 1.00 | 1.00 | 1 | 465.00 | .017°* |
| Passage 2 | 1.00 | 1.00 | 1.00 | 1 | 530.00 | .072° |
| B (one idea unit) | | | | | | |
| Passage 1 | 0.57 | 0.86 | 0.57 | 0.71 | 612.00 | .679 |
| Passage 2 | 0.63 | 0.63 | 0.75 | 0.75 | 466.50 | .036°* |
| C (multiple idea units) | | | | | | |
| Passage 1 | 0.67 | 1.00 | 0.67 | 1.00 | 635.00 | .885 |
| Passage 2 | 0.25 | 1.00 | 0.50 | 1.00 | 352.00 | .001°** |

*Note*. ° = experimental mean>control mean. P1=passage 1. P2=passage 2.
*p<.05. **p<.01.

Interaction between Experimental Condition and other Independent Variables

After determining that the road-map did significantly improve comprehension of a Talmudic passage, we investigated whether standardized reading score (CTP), Talmud grade on the report-card, or class-level affects the strength of the treatment effect. We analyzed these interaction terms for Passage 2, but not for Passage 1 alone because the results were not significant in general for this passage.

We investigated whether a more skilled reader, as indicated by a higher CTP score, benefits more from the scaffolding provided in the experimental condition than an average or poor reader, as indicated by lower CTP scores. There are several studies that support this hypothesis- that weaker readers are not able to integrate the information provided about text structure to improve comprehension (Armbruster & Anderson, 1980, as cited in Armbruster et al., 1987; Berkowitz, 1986).

We also considered the possibility that the trend might be in the opposite direction. Some of the literature has shown that skilled readers naturally intuit the underlying structure of a passage (McGee, 1982; Meyer, Brandt, & Bluth, 1980; Taylor, 1980), and thus it is less skilled readers that may benefit more from assistance in identifying the underlying structure of a passage. Several studies have demonstrated significant benefits for weaker readers of being given explicit instruction into a text's structure (Weisberg & Balajthy, 1989; Williams et al., 2005, 2007, 2009).

We asked the same question about Talmud skill level: would students with greater Talmud skill benefit more or less than weaker Talmud students from access to the text structure of Talmudic passages? Talmud report card grade and class-level, two measures of Talmud

ability, were tested for moderating effects. Talmud report card grade is the teacher's evaluation of the student's work in Talmud class in specific. Class-level identifies which of the three academic tracks the student is in for Talmud class: Core, the lowest class-level, Honors, the middle class-level, or High Honors, the highest class placement for Talmud. These two interaction terms were studied to determine whether a skilled Talmud student, regardless of general reading ability, is helped more or less than an average/poor Talmud learner when given information about the underlying structure of a Talmudic passage.

In order to investigate these questions, three interaction terms were tested in separate ANCOVAs for Passage 2 alone, the passage where a treatment effect was observed, to see if a higher CTP score, Talmud report card grade, or class-level results in a greater treatment effect. We avoided testing these covariates in the same model for two reasons. Firstly, each additional covariate lowers the power of the test. Secondly, because CTP Score, Talmud report card grade, and class-level are all measures of academic ability, they are all correlated with one another. Thus, separate models were required to clarify the independent effect of each interaction term.

No significant interaction was found for Condition*CTP or Condition*Report Card. These results suggest that the scaffolding helped the more skilled readers/Talmud students and less skilled ones equally. Condition*Class-Level was not significant either for Passage 2, though it was close to significant, $F(1,68)=3.14$, $p=.081$. See Figure 2 for the mean score of each class-level in the two conditions. See Table 8 for the significance levels of the interaction terms tested on Passage #2.

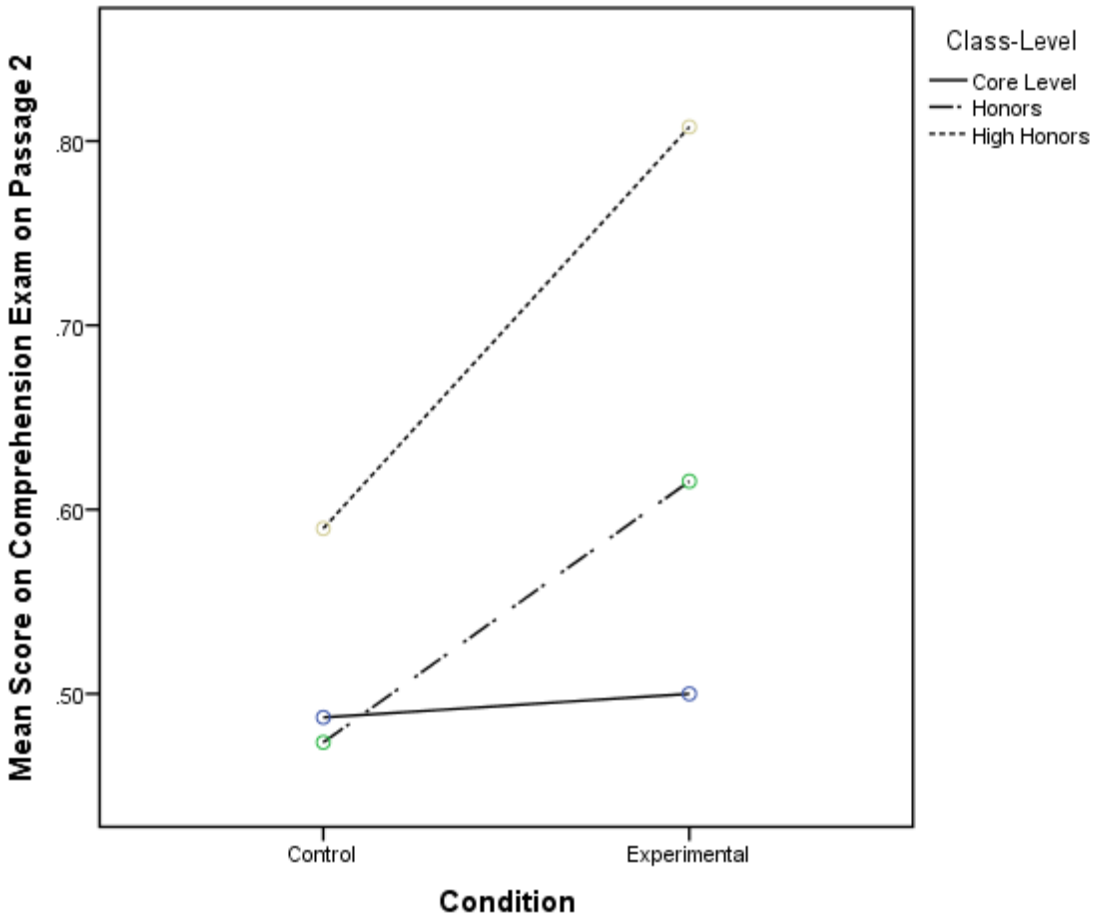


*Figure 2*. Results for Condition x Class-level interaction term. This graph shows the mean exam score for each track in both conditions.

One last interaction term was investigated, Condition*Gender, to consider if there was a greater treatment effect for males or females. An ANCOVA was run for this interaction term for Passage #2. No significant interaction was found (see Table 8). Thus, the treatment effect is equivalent for males and females.

Table 8

*Moderator Variables, Passage #2*

| Interaction Term | F | *p* |
|---|---|---|
| Condition x CTP | 0.01 | .929 |
| Condition x Report Card | 0.10 | .754 |
| Condition x Class-Level | 3.14 | .081 |
| Condition x Gender | 0.95 | .333 |

# DISCUSSION

The main purpose of this study was to investigate whether a road-map, a visual guide that states the text-structure of a Talmudic Passage, helps students understand a Talmudic passage better than their counterparts who do not have access to this guide. The findings support the hypothesis that students with a road-map of a Talmudic passage have superior comprehension of that passage, at least in certain contexts. The various questions on the comprehension exam were analyzed to see what type of information was better understood in the treatment condition as well as to better guide the formulation of these exams for future studies.

The secondary questions that were investigated were a)on which passages would this treatment effect be seen, and b)which students would benefit most from this treatment? A treatment effect was found for one of the two passages tested and the treatment effect was not statistically different for students of varying abilities or for males and females.

## The Treatment Effect

The results from this study demonstrate that a road-map of a Talmudic passage, as defined above, can help students better understand a Talmudic passage when the students have been familiarized with how the road-map works, have a list of word translations, and know how the passage is punctuated. This finding confirms the hypothesis that text structure awareness helps readers of Talmud just as awareness/knowledge of the text structure of an expository or narrative passage has been demonstrated to help beginning readers improve their comprehension of a passage. We interpret our findings in the same way that previous authors have explained theirs; that is, having a sense of the underlying structure of a passage enables a person to have a

mental model within which to store all the details of the passage, and to synthesize and make sense of the disparate parts (Rumelhart & Ortony, 1977; Van Dijk & Kintsch, 1983).

Discrepancy between the Passages

The second finding in this study is intriguing as well. The results demonstrate that there are conditions in which the road-map does not help, at least not enough to have a significant effect, as in the case of Passage 1. Why access to the road-map significantly improved comprehension of Passage 2, but not of Passage 1, is unclear. We consider three possible reasons for the discrepancy.

One possible explanation for the discrepancy is the level of difficulty. Although the two passages are equivalent in regards to word frequency, which is a rough estimation of student-familiarity with the words, Passage 1 is conceptually more difficult than passage 2. To begin with, Talmudic passages are more challenging to read than an average expository text, and this passage is even more difficult, on a conceptual level, than an average Talmudic passage. Thus, it could be that there is a limit to how challenging a passage can be for text structure knowledge to be beneficial. Though the literature has not directly addressed this question of how the benefits of text structure strategy vary with passage difficulty, earlier studies have noted that text structure strategy is not beneficial on unfamiliar passages or passages that require a high level of prior knowledge (Weisberg & Balajthy, 1989). Thus, there is evidence that on passages that the reader has greater difficulty with, benefits from text structure strategy are not seen. This may explain why the participants in the experimental condition did not perform significantly better than the participants in the control group on the Passage 1 comprehension exam.

Passage 1 is conceptually more difficult than Passage 2 because of the nature of its central question. Passage 1 centers around a question of why a certain statement was necessary, and thus involves a lot of very nuanced problems raised and answers given. It may be more difficult for students to wrap their minds around this type of question since it is very technical and abstract. Passage 2, on the other hand, centers around a simple definitional question of what a term means. Thus, passage 2, conceptually, is much more concrete and straightforward. Not only is the focus of Passage 2 easier conceptually, but students are also used to encountering this kind of question in many of their classes and areas of study. Students learn definitions all the time in math and science class. On the other hand, why an author uses a particular choice of words instead of another is not a question High School students regularly encounter in their classes. Consequently, the type of discussion that is found in Passage 1 is both more difficult and less familiar to Talmud students.

A problem with this explanation of why a treatment effect was not found in Passage 1, is that if Passage 1 was more difficult conceptually than Passage 2, one would expect the mean score of Passage 1 to be significantly lower than that of Passage 2, but surprisingly, it is not. The mean scores on the 2 passages are statistically equivalent. This does not necessarily undermine the above explanation, however, as the mean score may not be sufficient to measure the passage difficulty. Some parts of the passage may be easy to comprehend, while others may be particularly difficult. So, even with equivalent means, one passage still may have more particularly difficult parts than the other. There is evidence to support this possibility: despite equivalent mean scores on the two passages, two questions had particularly low scores on Exam 1, lower than the mean of all questions on Exam 2. Questions 2 and 7 on the Passage 1 Comprehension Exam had means of 0.28 and 0.14 correct respectively. By contrast, the mean of

the question with the lowest score on the Passage 2 Comprehension Exam was 0.31. Thus, there is some indication even in the test scores themselves that corroborate that Passage 1 in some ways is more difficult than Passage 2.

Given that Passage 1 appears more difficult in certain ways than Passage 2, it is possible that the scaffolding of the road-map was not sufficient to get the students through the obstacles of this more conceptually challenging Talmudic passage. Maybe the road-map only achieves comprehension benefits by allowing students to overcome difficulties with words and syntax, but not in overcoming difficulties with the central concepts of the passage. It seems logical that a framework helps a reader with organizing confusing language. However, if the ideas are too confusing, as may have been the case in Passage 1, and possibly is the case in general in passages focused on textual questions, it is understandable that even a framework won't help the reader decipher these passages. Organizing various confusing ideas won't help a reader uncover the meaning of those ideas. Text structure awareness can only go as far as to show the connections between the ideas.

An alternative possibility of why the road-map helped in Passage 2 but not in Passage 1 may have to do with the structure of the passage, or the organization of the components in that passage, the order and connections between the *questions*, *answers*, *statements, challenges, refutations,* and *proofs*. Passage 1 contained a long tangent (that is, a set of components that do not continue on topic of the previous component), while Passage 2 did not contain a tangent. The presence of this tangent in Passage 1 and the absence of a tangent in Passage 2 was confirmed by two additional Talmud scholars (in addition to the researcher). It is possible that the presence of a tangent causes the passage to become too fragmented, turning the passage into a composite of two separate topics. Therefore the presence of a tangent may counteract the

assistance that a road-map can have. A road-map may only help in passages where the structure is holistic and focused.

There is evidence to support this hypothesis from other studies. It has been found that readers benefit less or not at all from use of text structure strategy on less structurally organized passages. Both adults (Meyer, Young, & Bartlett, 1989) and college students (Meyer & Freedle, 1984) have shown greater benefits from text structure strategy instruction on comparison and causation structures, which are more organized than description structures (Meyer & Freedle, 1984).

A third possible explanation that accounts for different findings for the two passages does not assume any substantial difference between the passages themselves, but just between the nature of the exams for each passage. Perhaps the Passage 1 questions were not worded in a way that would pick up on differences in the comprehension of participants in the two treatment conditions.

The questions that showed the most significant differential between the experimental and control conditions were the questions that had a high number of answer choices presented. The comprehension exam on Passage 1 did not have many questions with more than 4 answer choices. The one question on the exam (Question 11) that did have 6 answer choices was the question on the exam that was closest to being significant. The questions on Exam 2 that showed the greatest differences between the conditions were questions with 100 possible answer choices. Passage 1 had no questions with this order of magnitude for its answer choices. If this explanation is correct, a test constructed with questions with a greater number of answer choices

would have shown a significant difference between the two conditions even on this exact passage.

The significant treatment effect observed on Passage 2 has great implications that will be discussed later on. Three possibilities were explored to explain why the findings of Passage 1 did not parallel the findings of Passage 2. Future studies will have to distinguish between these three possible explanations.

## Analysis of the Individual Questions

The questions on the two comprehension exams were divided into three categories of questions: (1)main idea questions, (2)questions that check for understanding of a particular idea unit (defined as one box/component or consecutive boxes/components on the road-map)- generally equivalent to one or two sentences, and (3)questions that check for understanding of multiple idea units. Analysis of the types of questions used on each exam showed that the experimental group only did significantly better on the main idea question on Passage 1, and on Passage 2, the experimental group only did significantly better on the detail questions- the groups of questions that check for understanding of single and multiple idea units.

This discrepancy may be explained by the varying level of difficulty between these two passages. It is possible that on a more difficult passage, the road-map helps the participants understand the main idea better but is not enough to help them understand the details better. Additionally, on a more concrete passage, perhaps the road-map does not help improve students' identification of the main idea as much, but it does significantly help the students understand the details better. This finding seems to suggest that the road-map helps students reach a different level of understanding on different passages- on easier ones it may help a little with the main

idea, but its primary role is in assisting in clarifying the details of the passage, and on harder passages it helps students almost solely with better identifying the main idea and does little to clarify details. This is something that repeated studies on a greater number of each kind of passage would need to confirm, given the small number of passages used and the small number of each kind of question used in this study.

The second pattern noted about the types of questions that led to significant differences between the groups is that the number of answer choices presented as options seemed to highlight the experimental group's superior abilities. The questions that showed the most significant differences between groups (Questions 8 and 9 on the Passage 2 test) had 100 possible answer choices (since there were multiple blanks that could be filled in from a bank). All questions on the two exams that had 6 or more choices allowed (Question 11 on Passage 1 Test; Questions 8, 9, and 10 on Passage 2 Test) were either significant (Questions 8, 9, and 10 on the Passage 2 Test) or close to significant (Question 11 on Passage 1 Test). Other questions with fewer choices were significant as well, but it is noteworthy that all questions with a high number of answer choices were significant. See appendices O-P for a full listing of the significance level of each question on the 2 exams.

## Moderating Variables

The question of which students benefited from the road-map was interesting to look at as well. There is evidence from the literature that certain students benefit from structural support more than others. There are studies that suggest that weaker students benefit more from text structure instruction (Balajthy & Weisberg, 1990), either because expert readers are thought to already intuit the text structure of passages (McGee, 1982; Meyer, Brandt, & Bluth, 1980) or

because expert readers have more strategies they naturally employ to help them understand difficult passages. However, other studies suggest that skilled readers may benefit as much or even more than weak readers do when the text is more complex (Barnett, 1984; Berkowitz, 1986).

The analyses from this study did not demonstrate any significant differences for the treatment effect for different groups of students. Gender and Talmud report card grade had no effect on the strength of the treatment effect. Though none of the results were significant, class-level was close to significant in affecting the strength of the treatment on Passage 2, where higher Class-level was associated with a greater difference in the mean comprehension exam score for the two experimental conditions. Though none of these results rose to a statistically significant level, the direction of these findings suggests that if the study was repeated with a larger sample size, that class-level may be found to be a significant moderating variable of the treatment effect. If this was confirmed to be a moderating variable, future research on road-maps should focus on stronger Talmud students where the benefits of the training are the greatest.

The possibility that stronger students benefit more from text structure training in Talmud is understandable because it is a complex type of text. Given that Talmudic passages are particularly difficult, even reading the passage with scaffolding may not be enough to help less skilled students. Other studies would have to confirm whether this is the case.

Another possibility why skilled readers may show greater benefits on comprehension could be just related to the mode of instruction of the Text Structure strategy. It is possible that one session is not enough to clarify to less skilled students how to use and take advantage of the road-map. Only the more skilled students can intuit this with the brief training. However, it is

possible that with a more expanded course of training, less skilled readers would benefit as much from access to a road-map.

This possible need for greater training for weak readers is supported by recent literature on struggling readers. Several studies demonstrate that struggling readers need more instruction and in a more intensive format in order to attain mastery. Providing instruction to struggling readers with a greater teacher to student ratio, with a greater amount of modeling, and providing more opportunities for student response and teacher feedback are three elements that have been found to be necessary for weaker readers to make progress (Fuchs, Fuchs, & Vaughn, 2014; Mathes et al., 2005).

The other moderator variable that was analyzed was not one raised in earlier TSS literature. TSS literature has not noted any difference between the genders on text structure strategy benefits. It was investigated in this study, though, since Talmud is a subject that has not been researched much, and we wanted to check if the different genders approach Talmud study differently. The results, however, do not confirm any difference between the genders in reading Talmudic passages, at least in regards to text structure benefits.

## Limitations and Further Research

The present study demonstrates the benefits of making students aware of the text structure of a Talmudic passage as they study it. In addition, the present study demonstrates that this benefit may vary depending on the passage read. Due to the design, these findings were shown through two separate statistical analyses, a 2x2 ANOVA on the full data, and an independent univariate ANOVA on each passage alone. An enhanced design would allow both of these research questions to be investigated through one statistical model.

The design of this study involved only two testing sessions at which all participants were present and involved two test passages. Thus, the ANOVA that included the data on the test scores from the two passages was only able to contain one within-subjects variable (condition) and one between-subjects variable (order). It was not able to have an additional within-subjects variable, passage number. A particular statistical model can only be used if there is data for every possible combination of the variables. The 2x2 ANOVA that was used, has 4 possible combinations of the data: a)control, order A, b)control, order B, c)experimental, order A, d)experimental, order B. In this study, there was data for each of these combinations of variables, and thus this model was used.

However a 2x2x2ANOVA (condition* order*passage#) could not be used. This model has eight combinations: a)control, order A, Passage1, b)control, order A, Passage2, c)control, order B, Passage1, d)control, order B, Passage 2, e)experimental, order A, Passage 1, f)experimental, order A, Passage 2, g)experimental, order B, Passage 1, and h)experimental, order B, Passage 2. In this design there is data only on half of these combinations, combinations a, d, f, and g.

An enhanced design that would have double the number of participants and in each session split the participants up into four groups instead of just two, would lend itself to analysis through one statistical model. In this enhanced design, in session 1, one group would do Passage 1 in the control condition and a second group would do Passage 2 in the control condition. A third group would do Passage 1 in the experimental condition and a fourth group would do Passage 2 in the control condition. In session 2, each group would do the other passage in the other condition. This design would provide data for all 8 possible combinations of the three

variables: condition, order, and passage, and thus would allow for all the results to be analyzed through a 2x2x2 ANOVA, and independent ANOVA's on each passage would be unnecessary.

Further research is needed also to delve further into two areas: to a) determine in what conditions a Talmudic road-map is useful and in what conditions it is not useful, and b) whether students can be taught to identify the text structure of passages independently.

To Determine in what Conditions a Road-Map is Useful

To expand on 'a,' further study is warranted comparing the effect of text structure support for Talmudic passages focused on textual questions (ie- why was the wording of the Tanaitic material worded a particular way) versus Talmudic passages focused on a practical question of what the law is (ie- what a Tanaitic source means or what a Tanaitic source implies about a particular rule). It would be interesting to see if the dichotomous findings on these two passages would be replicated in other passages of their type.

Furthermore, to determine under what conditions a road-map of a Talmudic passage is beneficial to students, a more robust readability scale of Talmudic passages should be developed that takes into account how abstract or concrete a passage's topic is, the word difficulty-level, and possibly other factors as well. Then this study should be repeated with passages of varying readability levels to see how the results vary with passage level.

Another classification of Talmudic passages into various Text-Structure types could be developed as well. For example, one type of Text-Structure could be a passage with one or more tangents. Another type of Text-Structure could be question-heavy. If several types of Text-structures are identified for Talmudic passages, the varying benefits of the road-map for the different types could be analyzed.

In future studies, the assessments for all passages should contain a greater number of questions with a high number of answer choices to distinguish between full and partial mastery, and they should contain both detail and main idea questions to allow researchers to see exactly what kind of comprehension benefits are achieved from a road-map of Talmudic passages.

In addition to further research about what passage types text structure is useful for, further investigation into which students most benefit from text structure support is warranted. Testing the moderator variables that were analyzed in the present study across more students or across a greater number of passages will give a better picture of the population-subset that gains the most from the use of a road-map in Talmudic study. If the same association is found as was found in the present study, but at a statistically significant level, it would confirm that more skilled students benefit more from the text structure support for Talmudic passages.

The generalizability of the treatment effect can be tested on two other factors- age and language. In the current study, the benefits of the road-map were investigated for a very limited age range- $10^{th}$ and $11^{th}$ grade students. The study should be repeated on a wider range of ages, both younger students beginning as early as sixth grade, as well as older students, college-age and even adults. It would be interesting to note if the treatment effect varies at all with age.

The current study can be repeated with one other variable changed- the language. This would help to characterize the nature of the benefit of the road-map to readers. If the protocol was repeated with all the same stipulations as the current study, with just the language of the passages changed to English, and benefits of the road-map were still found, it would confirm that the road-map helps with comprehension by bringing the ideas together in a clearer way.

However, if there were no benefits in this scenario, it would suggest that the road-map's benefit is merely in navigating difficult language.

To Determine if Students can be Instructed to Identify Text Structure

Another limitation to this study was that there was no transfer test. Reading comprehension benefits were only analyzed for the passage in which the road-map was used. Follow-up studies are needed to test whether near transfer and far transfer occur. Even though the training in this study was brief, it can be investigated whether this training is sufficient for improving comprehension on other similar Talmudic passages, and also on non-similar Talmudic passages.

If a study with the identical protocol is conducted, and transfer is not demonstrated, further research needs to show whether students can be taught to identify text structure of Talmudic passages independently with more intensive training. Based on TSS instruction research that has been conducted so far (Armbruster et al., 1987; Bartlett, 1978; Leon & Carretero, 1995), it seems that several sessions would probably be needed for such a training program before this form of TSS instruction is likely to demonstrate comprehension benefits on other passages. If this skill is shown to be teachable with the same training protocol or even only with a more intensive protocol, it would significantly expand the usefulness of the finding that road-maps help students better understand Talmudic passages. It would be especially useful and efficient for schools if this instruction can happen via a web-based program as recent studies have shown possible with text structure of expository texts (Meyer et al, 2002, Meyer & Wijekumar, 2011). A web-based program would enable a broad implementation of a training program, obviating obstacles of finding trainers to go to many different schools,

If later research shows that they can learn and internalize the skills to identify the text-structure of any Talmudic passage independently, Talmudic students would better be able to understand all future passages they study after TSS instruction. Whether this skill is teachable with traditional instruction or via automated electronic instruction has yet to be determined by further studies, but has significant potential for Talmud education.

## Conclusion

Talmud instruction in Jewish Modern Orthodox High Schools has much room for improvement. As more students get frustrated with challenging Talmud study, students, parents, and school administrators in the last decade have been voicing concerns with the current Talmud program (Segal & Bekerman, 2009), but unfortunately solutions are still being awaited. This struggle with instruction of a subject that is at the core of the education of Modern Orthodox Schools and a subject that has been taught within this community for hundreds of years, warrants some reflection on the challenges and some solutions for improvement.

The present study supports a solution from a well developed area of research- the field of text-structure. Research in the field of text-structure over the past four decades has revealed the power that a reader's awareness of the passage organization has on reading comprehension. This field of research has made great progress on making difficult and seemingly confusing passages in narrative and expository texts understandable to a wider range of readers.

The present study opens new possibilities for Talmud teachers who are struggling to find ways to better help students reach proficiency in independent Talmud study. It extends the literature on text structure to a new genre. It demonstrates that teachers can give their students road-maps of the passages they teach to better help them understand the passages in order to

provide greater clarity for their students. If students better understand each passage they study, they are likely to become more engaged in Talmud study, leading to a faster acquisition of skills.

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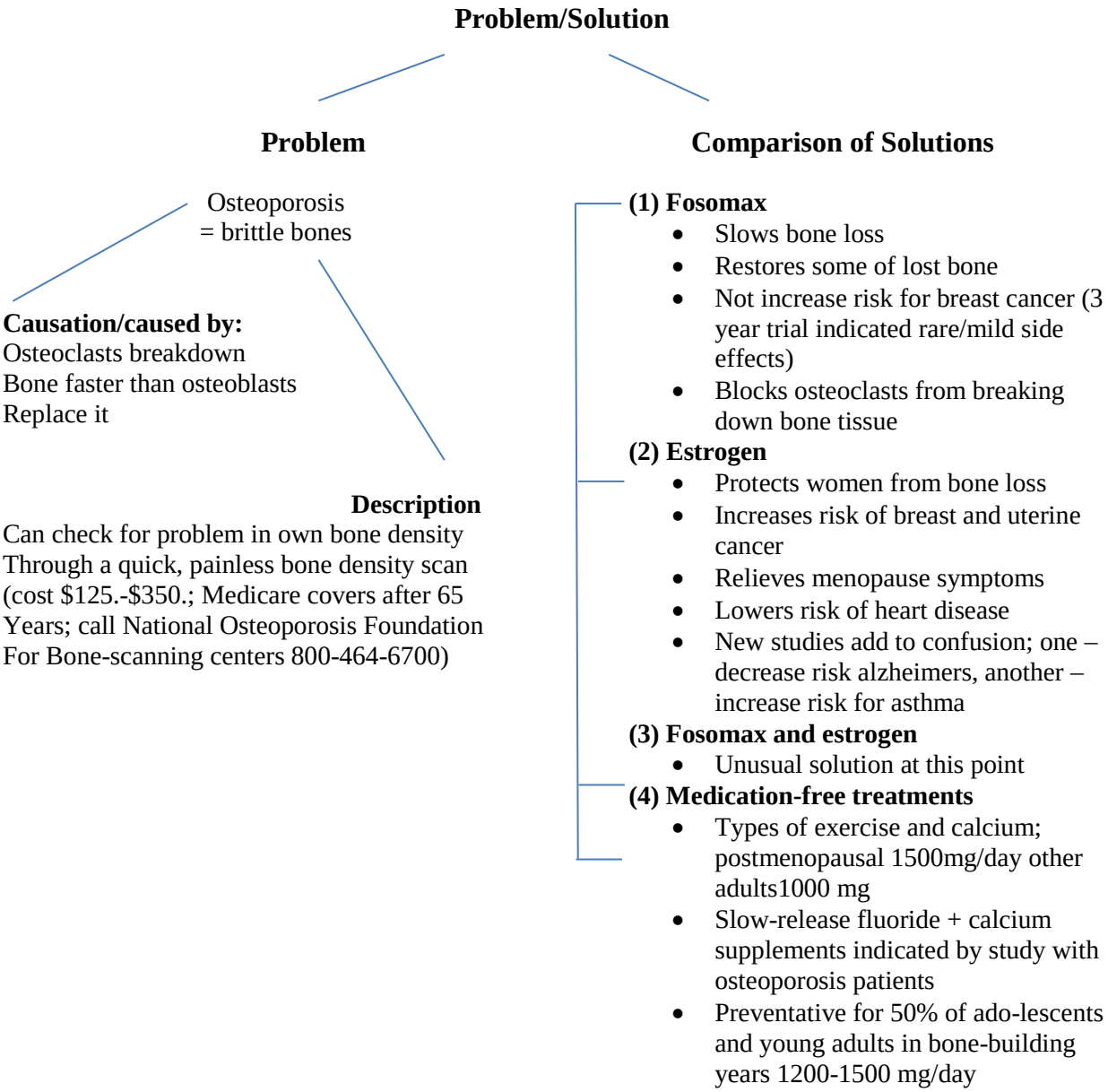
Appendix A

Example of a particular top-level structure of an expository text




Reproduced from Meyer, 1999

Appendix B

Example of the top-level structure of a particular narrative text

STORY STRUCTURE AND RECALL

TABLE 1

SUMMARYOF REWRITE RULES FOR A SIMPLE STORY GRAMMAR

FABLE → STORY AND MORAL
STORY → SETTING AND EVENT STRUCTURE
SETTING → { STATE* (AND EVENT*) / EVENT* }
STATE* → STATE ( (AND STATE)*)
EVENT* → EVENT ( ( { AND / THEN / CAUSE } EVENT)*) ( (AND STATE)*)
EVENT STRUCTURE → EPISODE ( (THEN EPISODE)*)
EPISODE→ BEGINNING CAUSE DEVELOPMENT CAUSE ENDING
BEGINNING → { EVENT* / EPISODE }
DEVELOPMENT → { SIMPLE REACTION CAUSE ACTION / COMPLEX REACTION CAUSE GOAL PATH }
SIMPLE REACTION → INTERNAL EVENT ( (CAUSE INTERNAL EVENT)*)
ACTION → EVENT
COMPLEX REACTION → SIMPLE REACTION CAUSE GOAL
GOAL → INTERNAL STATE
GOAL PATH → { ATTEMPT CAUSE OUTCOME / GOAL PATH (CAUSE GOAL PATH) }
ATTEMPT → EVENT*
OUTCOME → { EVENT* / EPISODE }
ENDING → { EVENT* (AND EMPHASIS) / EMPHASIS / EPISODE }
EMPHASIS→ STATE
Reproduced from Mandler & Johnson, 1977

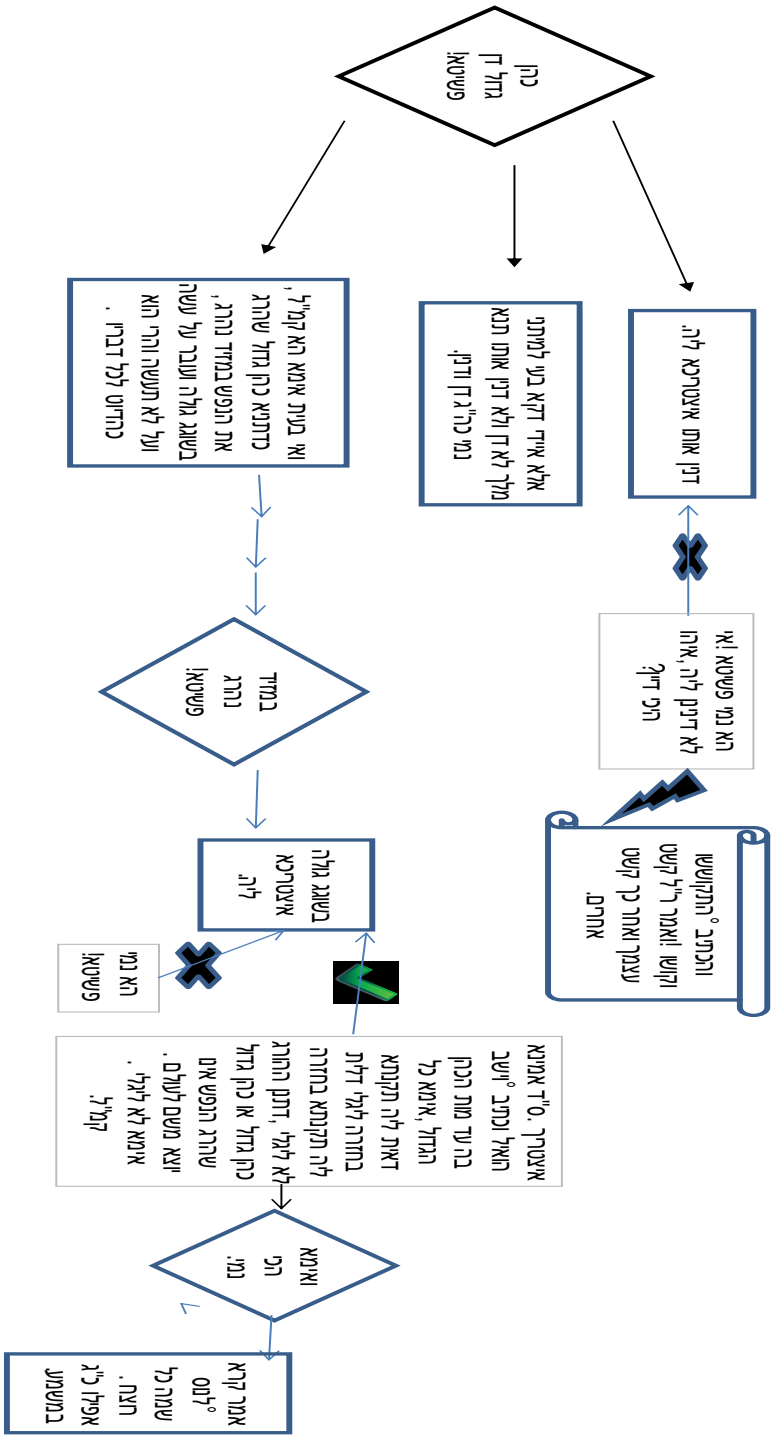
Appendix C

Word Difficulty Level of the 2 Passages

| Passage # | Number of-Words | | | | |
|---|---|---|---|---|---|
| | Total | Easy Words | | Hard Words | Repeat |
| | | Hebrew Words & Proper Nouns | 100 most frequent Aramaic Words | Less frequent Aramaic words | |
| Passage 1: | 143 | 92 | 40 | 11 | 67 |
| | | 92% | | 8% | 47% |
| Passage 2: | 144 | 83 | 42 | 19 | 71 |
| | | 87% | | 13% | 49% |

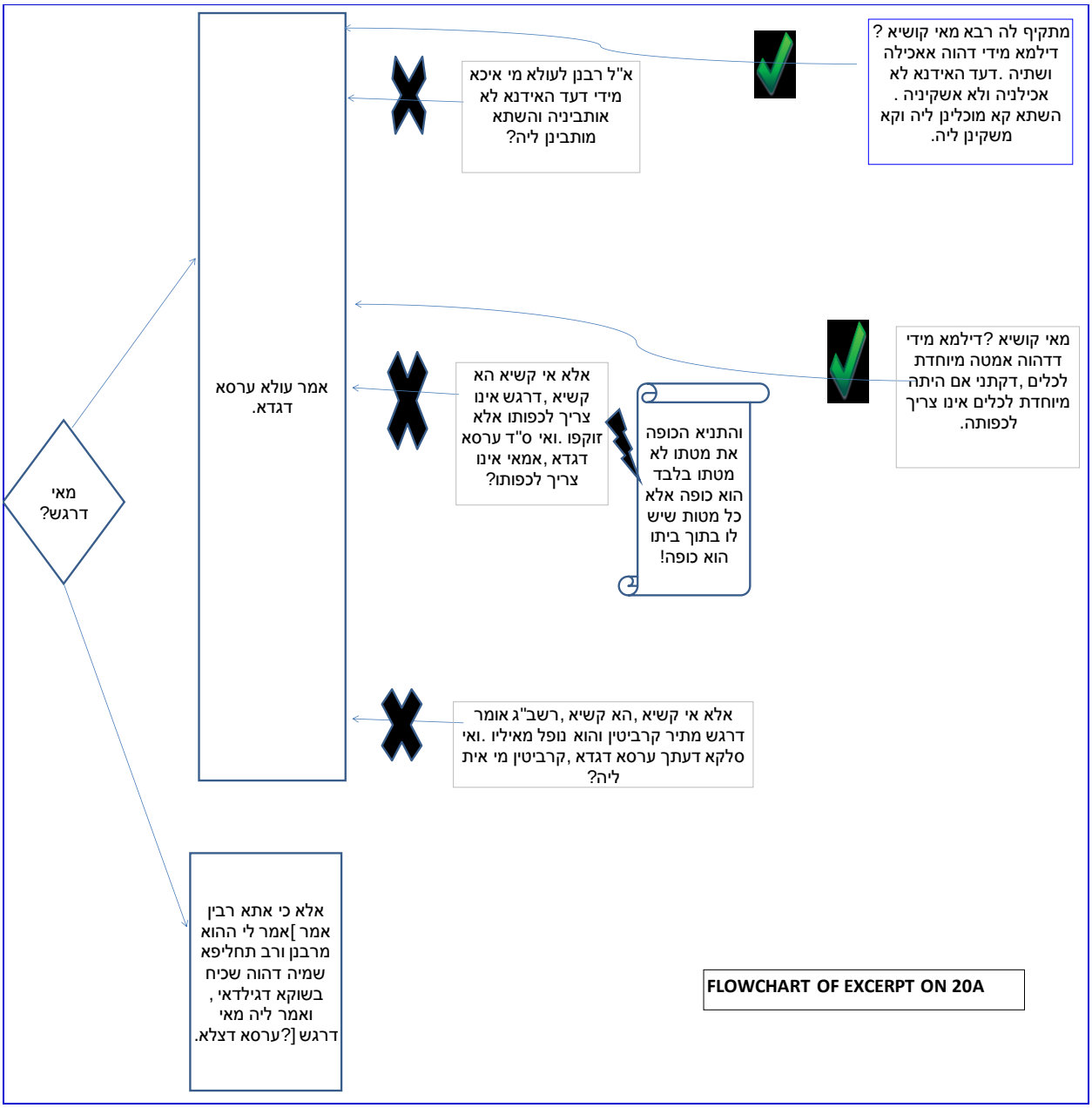
Appendix D

Road-Map of Passage 1



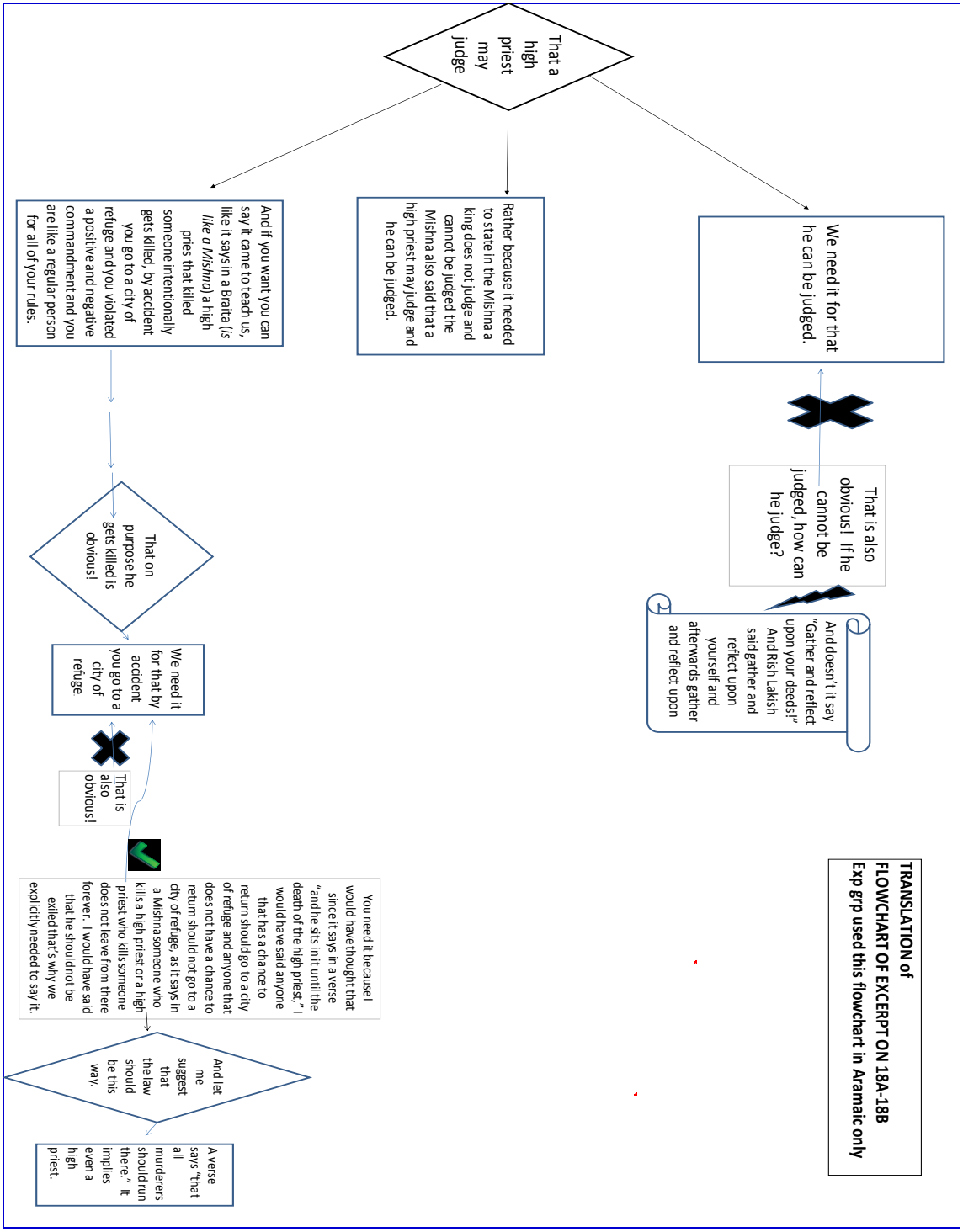
Appendix E

Road-Map of Passage 2



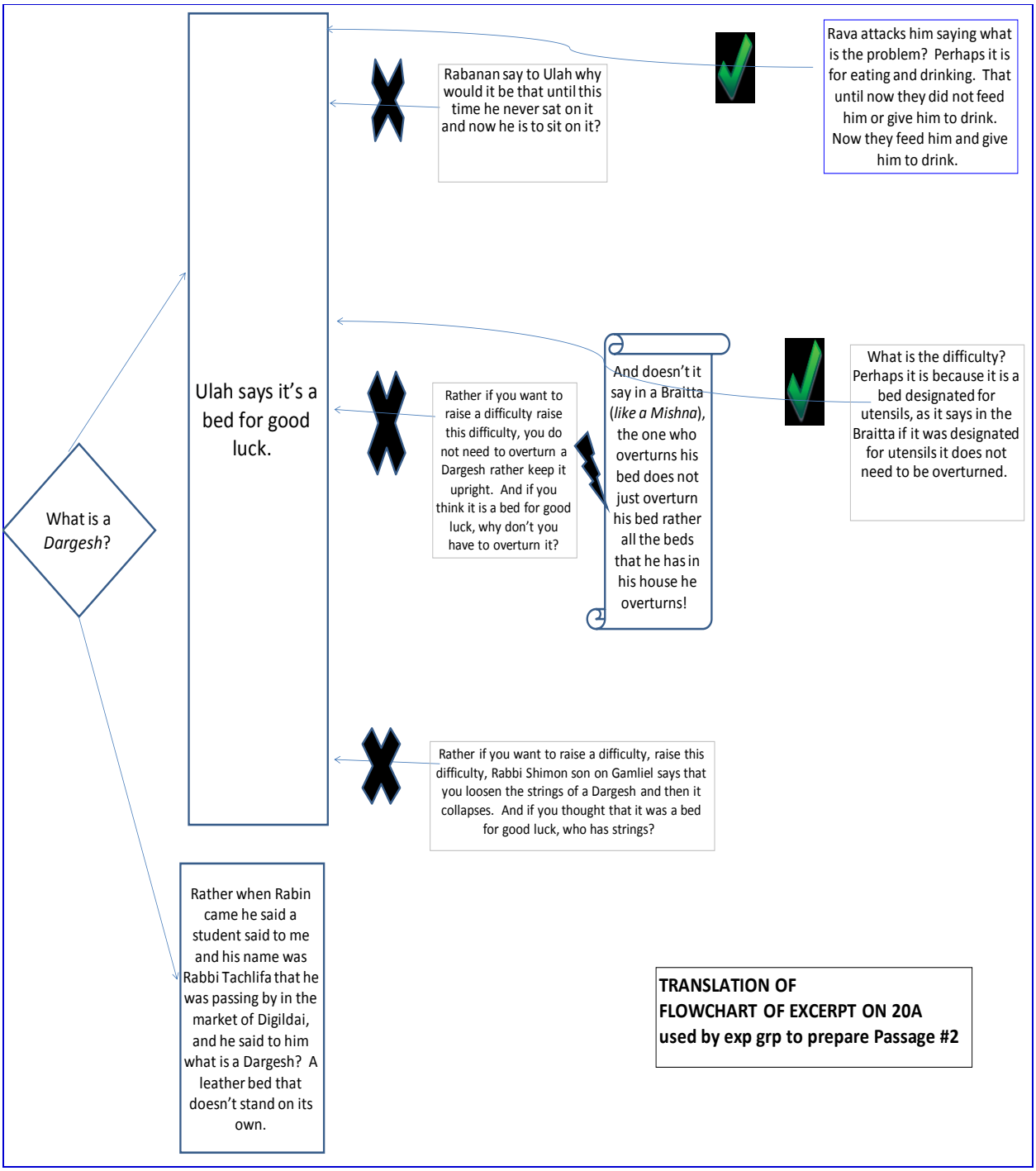
Appendix F

Translation of Road-map of Passage 1



# Appendix G

## Translation of Road-map of Passage 2



Appendix H

Coding of Structure of Passage 1

| Component | Researcher | Scholar 1 | Scholar 2 | Scholar 3 |
|---|---|---|---|---|
| #1 | Question | Question | Statement/Rejection | Statement/Question |
| #2 | Answer | Answer | Response | Answer |
| #3 | Rejection | Rejection | Rejection | Rejection |
| #4 | Proof | Proof | Proof | Proof |
| #5 | Answer | Answer | Response | Answer |
| #6 | Answer | Answer | Response/Statement | Response |
| #7 | Question | Question | Statement/Rejection | Statement/Question |
| #8 | Answer | Answer | Response | Answer |
| #9 | Rejection | Rejection | Rejection | Rejection |
| #10 | Response | Response/Proof | Response/Proof | Response/Proof |
| #11 | Question | Question | Question | Question |
| #12 | Answer | Answer | Answer | Answer |

# Appendix I

## Coding of Structure of Passage 2

| Component | Researcher | Scholar 1 | Scholar 2 | Scholar 3 |
|---|---|---|---|---|
| #1 | Question | Question | Question | Question |
| #2 | Answer | Answer | Answer | Answer |
| #3 | Rejection | Rejection | Rejection | Rejection |
| #4 | Response | Response | Response/Proof | Response |
| #5 | Rejection | Rejection | Rejection | Rejection |
| #6 | Proof | Proof | Proof | Proof |
| #7 | Response | Response/Proof | Response/Proof | Response/Proof |
| #8 | Rejection | Rejection | Rejection/Proof | Rejection |
| #9 | Answer | Answer | Answer | Answer |

# Appendix J

## Symbols used to represent the structural components in the road-maps


= Question


= Answer


= Proof for what the lightning bolt is pointing to


= The words in this box are rejecting what the arrow is pointing to.


= an explanation why the rejection is wrong;

*in other words*- it explains why the Answer that the statement tried to reject, should not be rejected


=tangent on previous section

(that does not effect the flow of the main structure)

<u>Connecting arrows:</u>

Use arrows to point from questions to answers.

Also use arrows to point from an answer to a question raised on that answer.

Appendix K

Key to Road-map for Passage 1

**Explanation of the structure flowchart:** **Gemara Sanhedrin 18a-18b**

 = Question  = Answer

 = Proof for what the lightning bolt is pointing to

 = The words in this box are rejecting what the arrow is pointing to.

 = an explanation why the rejection is wrong;

*in other words*- it explains why the Answer that the statement tried to reject, should not be rejected

 = tangent on previous section

(that does not effect the flow of the main structure)

**Overview/Explanation of the structure in our Gemara:**

There is one question which has 3 answers to it.

- The 1st answer is rejected, and the rejection is proven/affirmed.
- There is no further comments on answer #2.
- After the 3rd answer is given, the Gemara goes off on a **long tangent** (sidepoint) about an idea that came up in answer #3, but in no way rejects or proves answer #3.

Appendix L

Key to Road-map for Passage 2

**Explanation of the structure flowchart:** **Gemara Sanhedrin 20a**

 = Question  = Answer

(*on some copies, looks purple*)

 = Proof for what the lightning bolt is pointing to

 = The words in this box are rejecting what the arrow is pointing to.

 = an explanation why the rejection is wrong;

*in other words*- it explains why the Answer that the statement tried to reject, should not be rejected

**Overview/Explanation of the structure in our Gemara:**

There is one question which has 2 answers to it.

- There are 3 attempts to reject the 1st answer. The first rejection is thrown out.

  The second rejection is proven, but then thrown out.

  The third rejection stands.

- There is no further comments on answer #2.

Appendix M

Passage about Betty's favorite color

**Example below- do it on your own. Proctor will come around to check…**

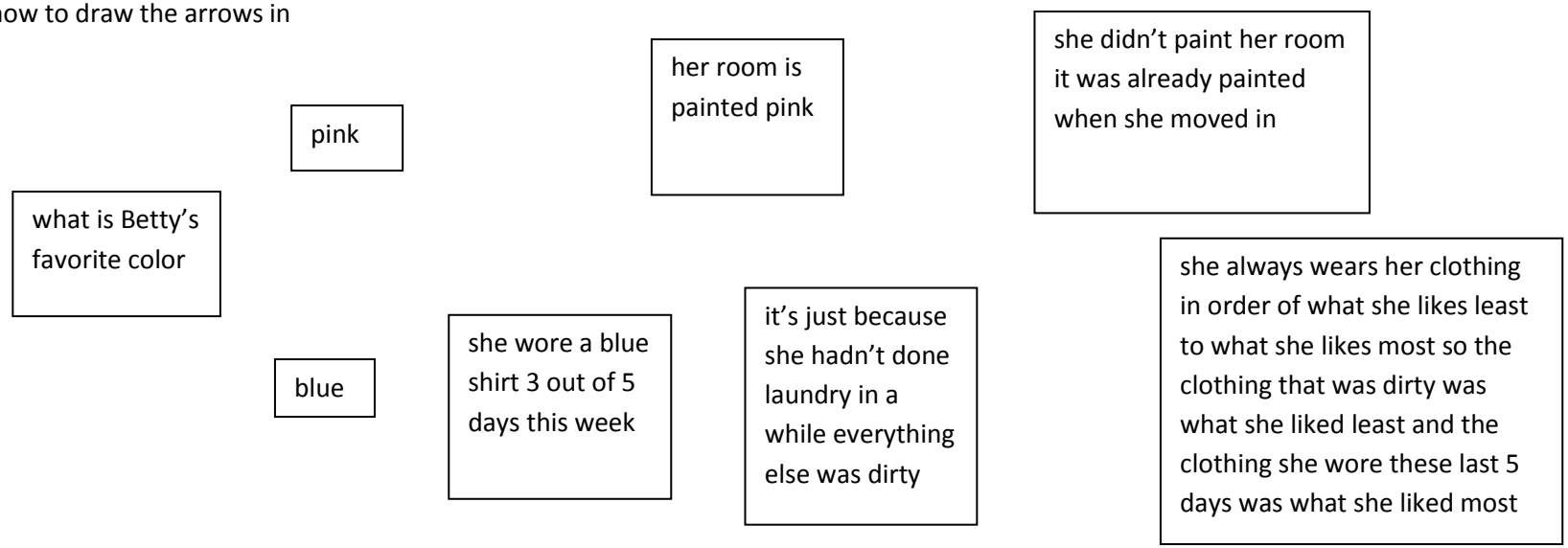
**What the Gemara would look like in the example:**

what is Betty's favorite color pink her room is painted pink she didn't paint her room it was already painted when she moved in blue she wore a blue shirt 3 out of 5 days this week it's just because she hadn't done laundry in a while everything else was dirty she always wears her clothing in order of what she likes least to what she likes most so the clothing that was dirty was what she liked least and the clothing she wore these last 5 days was what she liked most

**Your job:** Using the key (on the previous handout), draw what the Flow-chart would look like for this example. Below, the words are separated out into boxes, but what you need to decide is

a. what shape and color each box is

b. how to draw the arrows in



Appendix N

Passage about the Season Analysis

**Example #2 below- do it on your own. Proctor will come around to check…**

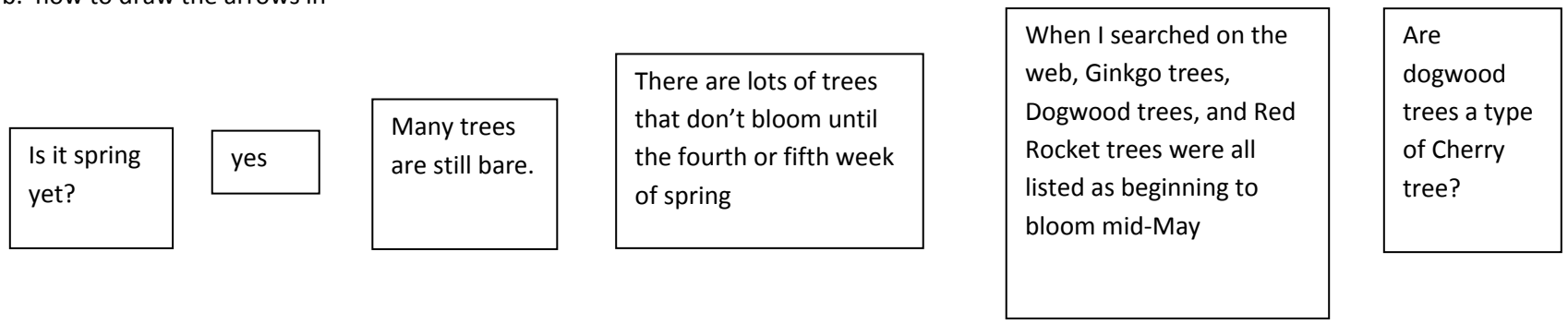
**What the Gemara would look like in the example:**

Is it spring yet yes many trees are still bare there are lots of trees that don't bloom until the fourth or fifth week of spring when I searched on the web Ginko trees Dogwood trees and Red Rocket trees were all listed as beginning to bloom mid-May are dogwood trees a type of Cherry tree

**Your job:** Using the key (on the previous handout), draw what the Flow-chart would look like for this example. Below, the words are separated out into boxes, but what you need to decide is

a. what shape and color each box is

b. how to draw the arrows in



Appendix O

Chi-Square of Score on Individual Questions by Condition on Passage 1

| Question # | Control | | Experimental | | | |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | $\chi 2$ | *p* |
| 1 | .29 | .46 | .57 | .50 | 5.83 | .016°* |
| 2 | .29 | .46 | .27 | .45 | 0.02 | .884 |
| 3 | .83 | .38 | .73 | .45 | 1.02 | .313 |
| 4 | .83 | .38 | .81 | .40 | 0.04 | .845 |
| 5 | .54 | .51 | .49 | .51 | 0.23 | .632 |
| 6 | .94 | .24 | .73 | .45 | 5.88 | .015* |
| 7 | .11 | .32 | .16 | .37 | 0.35 | .557° |
| 8 | .83 | .38 | .81 | .40 | 0.04 | .845 |
| 9 | .86 | .36 | .81 | .40 | 0.28 | .598 |
| 10 | .40 | .50 | .49 | .51 | 0.55 | .460° |
| 11 | .51 | .51 | .70 | .46 | 2.69 | .101° |

*Note*. ° = experimental mean>control mean.

*p<.05.

Appendix P

Chi-Square of Score on Individual Questions by Condition on Passage 2

| Question # | Control | | Experimental | | | |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | $\chi 2$ | *p* |
| 1 | .68 | .48 | .86 | .36 | 3.28 | .070° |
| 2 | .65 | .48 | .69 | .47 | 0.11 | .739° |
| 3 | .35 | .48 | .60 | .50 | 4.46 | .035°* |
| 4 | .76 | .44 | .74 | .44 | 0.02 | .892 |
| 5 | .32 | .48 | .54 | .51 | 3.50 | .061° |
| 6 | .81 | .40 | .71 | .46 | 0.93 | .335 |
| 7 | .65 | .48 | .57 | .50 | 0.45 | .502 |
| 8 | .11 | .32 | .51 | .51 | 13.98 | <.001°*** |
| 9 | .16 | .37 | .69 | .47 | 20.28 | <.001°*** |
| 10 | .32 | .48 | .60 | .50 | 5.51 | .019°* |
| 11 | .76 | .44 | .94 | .24 | 4.81 | .028°* |
| 12 | .35 | .48 | .43 | .50 | 0.45 | .502° |
| 13 | .76 | .44 | .80 | .41 | 0.20 | .659° |

*Note.* ° = experimental mean>control mean.

*p<.05. ***p<.001.