

KNOWLEDGE BANKS: USING TECHNOLOGY TO ENHANCE VOCABULARY
DEVELOPMENT

by

DENISE M GUY

B.S., Marymount College, 1984
M.S., Fort Hays University, 1993

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Secondary Education
College of Education

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2006

Abstract

As students are required to learn more and more and the world of technology evolves with access to information, how can schools use this knowledge to help students learn? This project focuses on the development of a prototype tool to assist students in building a vocabulary over time. The tool will allow students to capture definitions using research based graphic organizers. It also has a variety of ways students can represent the new words non-linguistically – graphically, audio, adding a variety of files.

A prototype of this tool was developed and expert teachers reviewed the tool for functionality. Students were also asked to review the tool. After revisions were made students were asked to use the tool in class in a preliminary field test. Students were then asked their opinion on how they felt this tool would help them learn.

This study involved four students and their experiences using the Knowledge Banks. The students overwhelmingly felt the tool would help them to organize their information, give them easier access to finding the information at a later date, and allow them ways to represent the new information non-linguistically. They enjoyed the ability to search for terms and find all the information that was connected to this term in any way. Having all of this information allowed them to make connections with their information they hadn't done before.

The implications of this study on education include; the need to provide ways for students to collect and build their knowledge, giving them access to tools for storage, allowing them to search their knowledge therefore making connections to new learning. This study showed that a tool can be developed that will help students learn new vocabulary and allow students to continue to learn this vocabulary by revisiting the terms over and over again year after year.

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Dedication

I would like to dedicate this study to my mother, Doris Robl, who has been there to support me through thick and thin. She pushed us to always keep learning and to continue to grow.

CHAPTER 1 - Introduction

Schools today work very hard to cultivate a successful learning environment. Teachers implement proven strategies and provide rigorous content for students to gain the knowledge necessary to live a productive life. In today's context of No Child Left Behind, *all* students must learn the content. Brain research states that an average learner must see or hear the information six different times in six different contexts before students understand it (Marzano, 2004). This implies that students must either read new information, have instruction on the new information, or learn it in the context of other topics. Marzano, 2004, suggests that students find a way to document the new learning over time so they have the ability to review the information again and again in different ways. As a result, students will have the opportunity to commit the new learning into long term memory.

The typical education system begins by students entering school with their backpacks full of empty notebooks and pencils. The teacher then provides them with a textbook full of information for students to learn. This textbook is aligned with the curriculum and is used throughout the year as reference for students in learning the content for the class. Students are allowed to make connections with this textbook. They spend many hours reviewing the materials in the book, looking at the media in the text that assists in their understanding, and using instructional methods like graphic organizers or notebooks to gain an understanding of the content. At the end of a typical school year, educators ask students to return the tool to which they made their mental connections. As they leave the classroom, students dispose of their notes, graphic organizers, and other tools they used to gain understanding of the content matter. Not only have we taken away the core of their knowledge building (their textbook) but students have also just disposed their record of what they have learned and both we and they have given themselves permission to forget it. And we wonder why they have forgotten so much when we see them again in the fall.

The education system today does not foster transfer of knowledge from one year to the next or even from one context to another within the same content area. Loss of learning during the summer is a critical issue in education (Kerry, T, & Davies, B., 1998). Many teaching tools have been developed to help teachers organize content material and provide good instruction, but

students do not have the tools needed to document their understanding and build on them. The development of the proposed Knowledge Banks would fill this void. Students would have their understandings captured so that they, their parents, and their teachers can tap into prior knowledge to continue the process of building new knowledge. According to one “key finding” from the National Academy of Sciences reports *How People Learn*, “if student’s initial understanding is not engaged, they may fail to grasp new concepts and information that is taught” (Bransford, Brown, Cocking, 2000, p 14). With the use of Knowledge Banks, teachers have the devices necessary to allow students to revisit their initial understandings and build on them. Teachers can now begin their lessons with a question and students will have a means for tapping into their prior understandings so they can move forward rather than having to relearn.

Another “key finding” from *How People Learn* is, “to develop competence in an area of inquiry, students must: (a) have a deep foundation of the factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application” (Bransford et al, 2000, p. 16). The use of Knowledge Banks tool will put into practice this key finding. Students will have the ability to document their new understanding in a variety of ways conducive to their individual learning styles; they will classify, organize and understand how this fits within the context of their own learning and finally, they will have access to a retrieval system that will enhance the system used in their own mind.

The use of this tool will also promote metacognition by allowing students to explain themselves, another means for improving understanding. Metacognition is the third “key finding” in *How People Learn*. As students are classifying and identifying how the new information fits with the old they will be monitoring their own understandings and reflecting on them.

This research represents the beginning stage of developing the Knowledge Banks tool; here we focus on vocabulary development as one piece of the Knowledge Banks. This area is of particular interest because of the effect that vocabulary has on narrowing the gap between socioeconomic groups (Marzano, 2005). Teaching the socioeconomic disadvantages is an area that is of particular interest for many schools and seems like the logical place to begin this process.

This project is the beginning of the development of a larger tool called the Knowledge Banks tool that could change the way we do school. With such a tool, schools will engage students in developing their own understandings and building upon those understandings rather than simply a place where information is presented. Students will have a device to help them continue to learn and show what they have learned in their process of education. Teachers will have a means to help students begin the process of building new knowledge. By knowing the extent of the impact on learning of such a tool, schools will change in a way that will help meet with the high standards being placed upon them.

A Vision for Schools of the Future using Knowledge Banks

Mr. Burr, a high school geometry teacher, is launching the study of parallel lines and the properties with a transversal bypassing the lines. He begins his study with a question for the students. “Students, would you get in groups of 3 to 4 and tell me what you know about parallel lines?” Students get into cooperative groups with their Knowledge Banks tool either on their personal laptops or digital assistants. They begin a searching process to tap into their prior knowledge and training on parallel lines. They look for the conceptual chunks they have gained in their past educational process to help gain meaning from the added information that Mr. Burr is about to give. “Group 1, would you tell me what you know about parallel lines?”

“We did a project using Power Point in the 5th grade in which we had to walk around town taking pictures of all the examples of parallel lines. We learned that the lines will never intersect” stated one student.

“We also learned in 8th grade math that when a line crosses through both lines there are certain predictable properties that occur,” said another student.

A third student said, “When I did a search for parallel, I found a concept map that I created in 7th grade communications when studying vocabulary. I remember now that parallel is the opposite of perpendicular and is like similar, equivalent, corresponding, and matching.”

As students are creating a conceptual framework for parallel, Mr. Burr is noting all the information given.

“I found a list of reasons how the revolutionary war parallels with the civil war. This doesn’t have anything to do with math!” another student proclaimed.

Mr. Burr then goes on to explain that the word parallel does not just pertain to lines that it has the same meaning in other content areas. It can mean similar or alike when used in history or science.

[At this point, students have had a chance to revisit important information they learned in the past and review it an additional time giving them an opportunity to attach past experiences to long-term memory. The resources and projects were looked at in a different way adding new merit and understanding to concepts introduced in the past. These concepts were not left at the doors of the 5th, 7th or 8th grade classrooms but carried with them throughout the students educational adventure. Students were able to connect the information to ideas outside of the content area to gain an additional perspective to the concept of parallel. Mr. Burr continues with class.]

“Now it time for us to gain new understandings on parallel lines with a transversal intersecting both lines.” After students participated in a project based activity that Mr. Burr had designed to show the relationships between the angles and properties of lines, students were then allowed to link their project design to their Knowledge Banks tool and add their new understandings for future use in physics, architecture, or other courses.

The concept of *transversals intersecting parallel lines* noted above is a typical concept discussed in Geometry classes all over the world, but the use of Knowledge Banks tool is unique and extraordinary. In order to implement a concept like the one described above, *without* Knowledge Banks, students would need to carry libraries of books, notebooks, posters, and other items with them at all times or depend on their memory. Even with all of these item available, they would not be able to glean out the optimal information for the concept being taught because (except for a well organized and outstanding memory) the searching mechanism is not available. Students today do not have the opportunity to look back at their old textbooks, search past notes, or revisit projects for which they participated. They must depend completely on their memory to make connections between past experiences and new learning. Depending on memory would be

optimal, but generally does not occur and therefore transfer of knowledge from one school year to the next remains a big concern.

Many times a concept covered in a previous course is not committed to memory. Wolf (2001) described our ability to remember information as a process of reconstruction of events over time. Memory is not formed at the instant the information is gained but is a dynamic process called consolidation that occurs over time. Reactivation of the original learning strengthens memory so it is less likely to fade. Students must take in the information over a period of time. They must have a period of hours, weeks, months or years to stabilized connections. Merely covering information does not build memory but the more fully we process information over time, the more connections are made, the more consolidation takes place, and the better our memory of the event will be (Wolfe, 2001). Consolidation is perhaps why researchers state that it is critical to hook new information to previous experiences to increase the strength and complexity of the neural connections and retention of learning. In the vision above, students are revisiting information from 5th grade, 7th grade, and 8th grade and they are reconstructing past experiences with a cueing system. The tool is available to recall past understandings and begin consolidation into memory.

If concepts taught in school are important enough that students do remember the concept addressed, sometimes the details of these concepts are missing. Depending on the effectiveness of the cue, the mind may have to *refabricate* or “fill in” what is missing from memory. As people tell their stories over and over, they redefine them, add to them, or make them more elaborate, and it is sometimes virtually impossible to know what is true or factual. One of the most effective ways of using our memory is by sorting and classifying information into chunks. Chunking helps students with the ability to recall information more easily, but the details may be missing or be very vague. If students had a tool in which they could revisit the details they would not need to *refabricate* the bits and pieces that are missing.

According to Wolf (2001), the research on the brain and its effects on education begins by supporting ways of building elaborate rehearsal strategies into our instruction to allow students time to process information and allow consolidation to occur. There are many great teachers who have initiated very effective means for teaching students. Some use project-based learning, which is excellent for understanding instruction in the context of a project and adding real meaning to the concept. Some teachers believe strongly in using graphic organizers to make

connections to prior knowledge. These are great strategies, but using them in conjunction with the Knowledge Banks adds a whole other dimension to learning and memory. The teaching strategy is used to gain the understanding of the concept, and the Knowledge Banks tool is used to organize the new knowledge for retrieval by connecting it explicitly with old knowledge and building additional understandings throughout the process of education.

Statement of the Problem

If students are to become life-long learners in the information age when information doubles every second, tools need to be available to organize, collect, categorize and document their understanding to assist them in contextualizing their information retrieval and gaining deeper understandings. *How People Learn* (2000) has established three key findings in the ways that people learn:

- 1) Students' initial understanding must be engaged or students may fail to understand new concepts.
- 2) Students must have a deep factual knowledge, understand these facts in the context of a conceptual framework, and be able to organize knowledge in ways that facilitate retrieval and understanding.
- 3) A metacognitive approach to instruction can help students take control of their own learning.

Many paper/pencil tools have been developed addressing these areas for maximum learning including graphic organizers and various note taking methods. Generally these are tools for the moment and are not utilized in an organized fashion for continued retrieval over a period of time. In other words, they often end up in the trash. With the abilities of technology to store, index and retrieve information, a tool can be developed to allow students ways to document their knowledge over time and not just for the moment. No such tool exists at this time. There are online tools available for teachers to organize and create courses, there are tools available for students to develop online portfolios, but there is not a tool available for students to keep their understanding in an organized manner so they can revisit, reorganize, and make new connections throughout their educational journey.

This research and design study includes the initial development of this tool. However, because of the limitations of time and resources, only one area will be used to focus the study.

This area is vocabulary development. The Knowledge Banks tool will be developed to specifically address vocabulary while looking for ways in which this tool can assist with a broader perspective of learning. Vocabulary development is selected because of its ability to target students of lower socioeconomic status.

Students will no longer go to school with an empty book bag full of empty notebooks and be issued a text to be used for the year. Students will enter school with a record of understandings created and the ability to retrieve these understandings for application, extension, and synthesis. Along with this benefit for students, teachers will have the ability to review the conceptions of students as they enter class. If students are not understanding or connecting the information necessary for learning, a record of the misconceptions along the way will be available to review and revisit.

Purpose of the Research and Design

The purpose of the research and design of this product is to use the current advances in technology to develop tools based on Marzano's (2001) *Background Knowledge* that will allow students the ability to:

- 1) *Document Understanding* of various terms using a variety of instructional tools within the Knowledge Banks, including graphic organizers;
- 2) *Activate Prior Knowledge* by retrieving vocabulary already presented for an opportunity to build on it, thus gaining a deeper understanding;
- 3) *Stimulate Metacognition* by rethinking or changing understandings as the student's conceptual framework is developed throughout the process of education;
- 4) *Categorize Information* by classifying and organizing using similarities and differences for easy retrieval, application, and synthesis; and
- 5) *Promote Transfer of Knowledge* by carrying a piece of the student's learning environment with them from year to year allowing them to engage in a metacognitive approach to learning with access to earlier understandings.

This tool could also have an extended use into postsecondary education.

Research Question

This research and design was guided by the following question in relation to the development of a prototype of the Knowledge Banks tool specifically addressing vocabulary development:

Can a Knowledge Banks tool be developed that has the potential to assist students in successful vocabulary development?

- 1) Would teachers use such a tool with teaching vocabulary and reviewing vocabulary?
- 2) According to teachers of different content areas, what features would make the tool valuable?
- 3) What aesthetic features would make the tool more useable?
- 4) According to teachers and students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?
- 5) According to students and teachers, would expanding the Knowledge Banks tool to all areas of instruction be useful in promoting transfer of knowledge across grade levels and content areas?
- 6) How would the use of the entire Knowledge Banks change the way teachers teach?
- 7) Would the entire Knowledge Banks concept change the way students learn?

Significance of the Product

The art of teaching is rapidly becoming the science of teaching. Many significant studies have identified how people learn and what strategies work in classrooms. The National Research Council's *How People Learn* has brought forth key scientific findings in learning. Robert Marzano supports this research with his meta-analysis of effective educational strategies from the past thirty years. He has determined which instructional strategies are the most effective for maximum student learning. This study was designed to determine if research-based instructional strategies can be enhanced by using technology to store, document and retrieve new information gained by students. Educators today are moving from the deliverers of content to facilitators of learning. Successful development of a useable Knowledge Banks tool could add another dimension to teaching, moving educators from facilitators of learning to facilitators of knowledge building for life.

Limitations of the Research and Design

Limitations of this project include lack of funding for professional programmers to complete this portion of the Knowledge Banks tool in a useable format. A prototype was developed focusing on one portion of the program - vocabulary development. This prototype should be substantial enough for limited use in school but would need to be revamped and revised to be used in a wider client base. It would then need to be taken to the next level and be developed to encompass a broader learning base outside of vocabulary development.

Another limitation is the access to testing subjects. This prototype was alpha-tested with only one group of teachers and students from one Midwestern school. As the tool is developed in a more extensive way it should be tested with a much broader group of teachers and students.

CHAPTER 2 - Literature Review

This literature review consists of three parts. The first part focuses on the research supporting the concept of a comprehensive tool, Knowledge Banks. The second part takes a look at the tools available today that are used for teaching and learning. And the third section is concerned with the narrowed aspect of vocabulary instruction. A complete comprehensive Knowledge Banks tool could be used for learning in all content areas and for learning in all aspects of education including history, mathematics, science and other content areas. The product developed for this proposal focuses only on vocabulary instruction because of the limitations listed above. The literature review describes the big picture and how the research supports the use of the Knowledge Banks tool in learning from several perspectives. A theoretical framework is developed that includes the latest research in learning and brain research. This framework is an important underpinning of the potential for the Knowledge Banks tool to become a powerful tool in education. But first the core areas addressed by this tool need to be identified and defined. The five properties this researcher has identified as the core characteristics that make the Knowledge Banks tool powerful include:

Document Understanding - The Knowledge Banks tool will document a student's own understanding of various terms using a variety of instructional tools within the Knowledge Banks such as graphic organizers and maps.

Activate Prior Knowledge - The Knowledge Banks tool will activate prior knowledge by retrieving information already documented from an earlier learning experience for an opportunity to build on it in order to gain a deeper understanding. The tool can also help to identify misconceptions that students may have gained that are preventing them from moving forward in learning.

Stimulate Metacognition – The Knowledge Banks tool will provide an avenue to look at gained knowledge and rethink or change understandings as a student's conceptual framework is developed throughout the process of education. Learning is achieved in the context of other learning.

Categorize Information – The Knowledge Banks tool will enable students classify and organize information using similarities and differences for easy retrieval, application, and synthesis.

Promote Transfer – The Knowledge Banks is the tool missing in education that will permit students to carry a piece of their learning environment with them from year to year. This tool will allow them the ability to apply earlier learning to new situations.

These properties will be supported as some of the most effective teaching strategies and theories known today are discussed. The research supporting this project are summarized below and then correlated with the properties of the Knowledge Banks.

The second part of the literature review focuses on the tools used and available in education at present. The tools are described and aligned to the characteristics of the Knowledge Banks to determine the similarities of the tools as well as establish the need for a tool with the characteristics listed above.

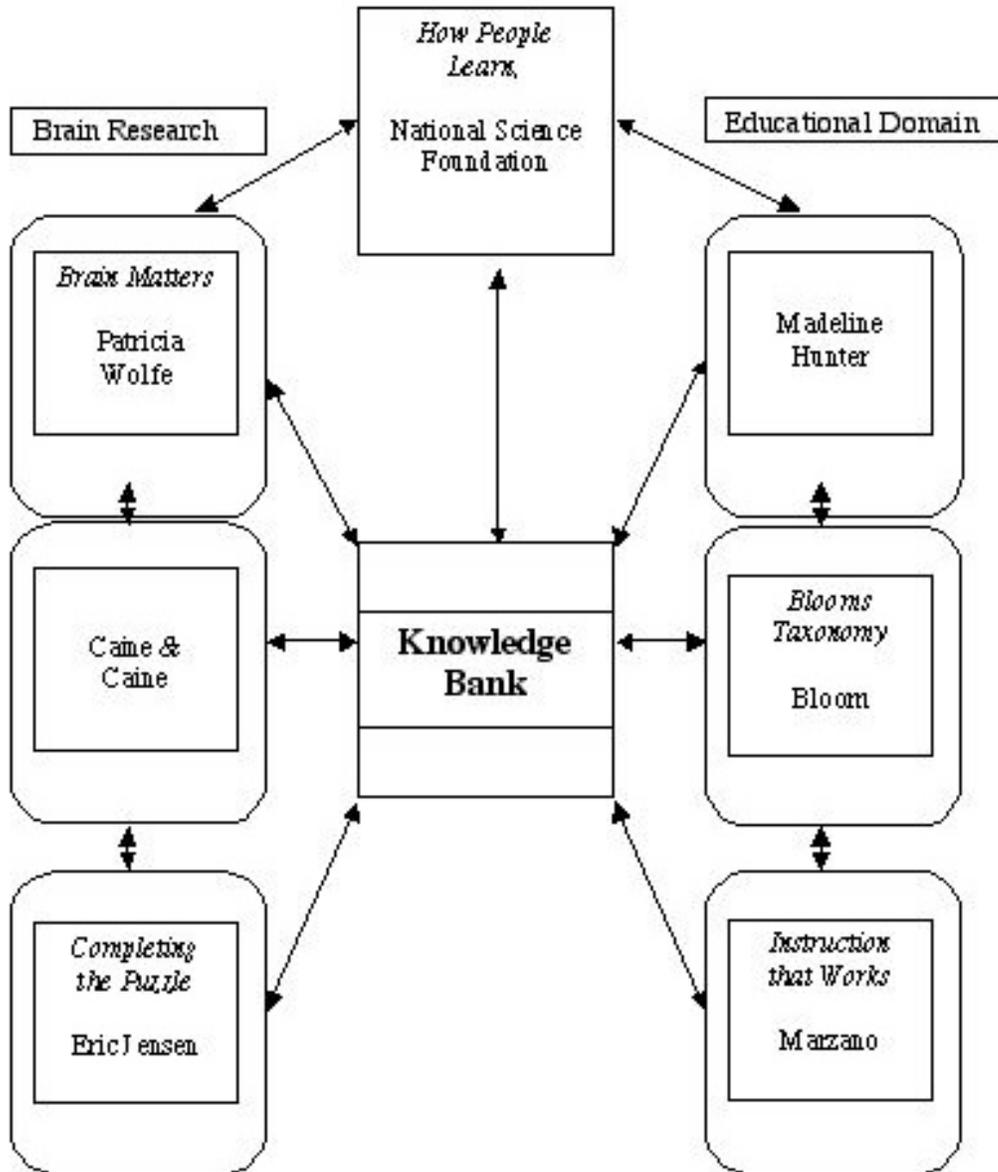
The third part of the literature centers on one portion of the Knowledge Banks, specifically, the tool used to collect, review, categorize and make connections with different vocabulary terms. This section outlines the support for vocabulary development in schools and the impact that a comprehensive vocabulary program can have on learning. Combining this information with the research behind the Knowledge Banks tool supports the development of the vocabulary portion of the invented tool. This vocabulary tool is the product that has been developed and is described in this research. It is the hope of this researcher that the development of the vocabulary tool will soon expand into the creation of the comprehensive Knowledge Banks.

Research supporting the development of the comprehensive tool called the Knowledge Banks

Figure 2.1 denotes the research basis for the development of the Knowledge Banks tool as a comprehensive tool to be used in all facets of education. The research is divided into two major categories including theorists associated with brain research and theorists associated with educational research. These theorists were selected because of their involvement of developing specific strategies and principles that are related to education. The research in *How People Learn* includes both aspects, brain research and educational research. *How People Learn* is a

comprehensive look at learning and includes some of the specific information from the other theorists mentioned in this document therefore it will be represented first in a category of its own.

Figure 2.1: Organization of Research Supporting the Knowledge Banks



How People Learn, National Science Foundation

How people learn is an evolving science. We know more today about how we learn than ever before. *How People Learn* is a synthesis of educational research regarding the study of the mind and how it relates to learning. This synthesis includes new research in transfer of knowledge, experts versus novices, child development, how the brain functions and technology. With this information educators have a better understanding of what is needed for maximum learning in all people including K-12 students. *How People Learn* looks at the research in all of these areas, synthesizes the data and has determined key findings in helping people learn.

Transfer of knowledge must begin with initial learning. Students must have a good understanding of the basic knowledge of facts for transfer to occur. They must do more than memorize the material but also allow enough time to process the information. Time to review the material and to develop new understandings and connections is critical for transfer to occur.

It is reported, (Bransford et al., 2000) that the difference between a novice and an expert is the amount of time that the act of expertise has been repeated and practiced. Students need time to gain an understanding of the underlying concepts and generate connections with other information they process to become an expert in the material.

The study of how the brain works is an exploding science. Tools have been developed that can actually track the parts of the brain that are working during instruction and other activities. Researchers know what parts of the brain help with speech, with movement, and with functions of learning. Brain experts also know what types of nutrition, exercise and movement gives us optimal learning. Students need to have proper hydrations for learning.

This resource (Bransford et al., 2000) identifies three key findings based on the synthesized research.

Key Findings in How People Learn

Identify preconceptions: Students enter school each year with preconceptions about how the world works. For new learning to occur the preconceptions must be tapped to determine if they are actually misconceptions. These misconceptions need to be identified and redirected for students to continue to build their understandings. If a student has a misconception about something that is needed for learning to continue learning will be hindered.

Know, Understand, and Organize Information: To be competent, students must know the facts; they must understand the facts in context and have the ability to organize these facts for easy retrieval. The ability to organize facts helps in transfer of knowledge enabling students to be able to apply the knowledge to new situations. Knowing how history applies in context can help with overall understanding of historical facts. If this information is presented and maintained, in an organized fashion, students will have a better grasp of the overall picture and be able to add additional information to the overall picture.

Metacognition: Verbalizing new knowledge helps students to take control of their own learning and keep track of their progress as they learn. Students can be taught strategies to activate their background knowledge. Some of these strategies include techniques and tools for thinking about one’s own learning including the use of graphic organizers.

The research about How People Learn directly supports the research behind the Knowledge Banks. Each one of the key conditions for promoting learning can be enhanced with the proposed tool. The developed tool will assist in implementing the key findings from the National Research Council in the following ways.

Table 2.1 Alignment between the elements of the Knowledge Banks and the key finding from *How People Learn*

Knowledge Bank	How People Learn
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	<i>Know, Understand, and Organize Information</i> – the first step to knowing the information is to document the data in an organized fashion.
2) <i>Activate Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior knowledge. Students will have the ability to revisit their prior understandings and build on them or change them depending on the needs.	<i>Identify Preconceptions</i> – by activating prior knowledge students and teachers will have the ability to check the misconceptions of the children.
3) <i>Stimulate Metacognition</i> – Students will have the tool available to revisit understandings and given the ability to verbalize what they have previously learned.	<i>Metacognition</i> – Students need to verbalize and take control of their own knowledge.
4) <i>Categorize Information</i> – By placing information into categories of learning	<i>Know, Understand, and Organize Information</i> – It is important to organize

that are meaningful to the student, the students will have a greater opportunity of recalling the information.	information into meaningful chunks.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas for an increase in transfer.	<i>Know, Understand, and Organize Information</i> – the act of organizing information helps with transfer of knowledge.

Note. All five elements are supported by the research in *How People Learn*.

Brain Research

Brain Matters, *Patricia Wolf, (2001)*

Learning is the process of building networks. Over a lifetime there are many networks built with interconnections made within the networks and an unbelievable variety of information. Our ability to remember is a process of recreating an event by drawing bits of information from the networks. Definitive elements are recalled and the brain fills in the rest of the elements for the complete memory. There is usually a cue that will initiate memory. If the cue is unclear or weak the memory may not be accurate or incomplete. To put the idea of networks into perspective think about a library. The books are organized in a fashion such that it is easy to find one piece of information relatively quickly. Think of how difficult it would be if the books were not organized in some type of system for recall. How long would it take to find the information if you had to look through all of the books in a library?

New knowledge is broken up into pieces and distributed throughout the memory making multiple connections with other bits of information. Within the multiple connections as new information is absorbed, the brain looks for patterns. The brain registers the familiar with the new in an attempt to make sense of the new. The brain resists having meaningless information imposed on it or isolated pieces of information unrelated. When the brain absorbs information, it looks for familiar patterns. If it does not find familiar patterns it may pay attention to the data for a short term because of the novelty, but if no sense is made of it then the information will not be processed further and it will be lost. Working memory is limited in what it can comprehend. It

can only hold a limited amount of information at one time, but there are strategies that can help with retention and learning thus improving the conscious processing.

Wolfe identifies five strategies that enhance the conscious processing of information:

- 1) *Chunking*: Chunking includes organizing information in meaningful units. Working memory is somewhat limited. If information can be placed into meaningful chunks then it is more easily remembered. An example includes memorizing a telephone number: we remember two sets of numbers and not seven individual numbers.
- 2) *Rote Rehearsal*: This includes repeating information or a skill many times. Rote Rehearsal is used to focus on learning procedural types of learning including driving a car, brushing your hair, and other procedural type activities. These activities then may occur without particularly tapping into conscious attention.
- 3) *Elaborative Rehearsal*: Immersing oneself into the meaning of information through elaborative rehearsals. Coverage of information does not build strong neural connections. In fact, if information is just covered it is seldom remembered past a test or may even be remembered incorrectly. Elaborative rehearsal is the process of fully processing the information over time. The more connections made with other knowledge the more likely it will be placed into long-term memory. Many strategies play into the elaborative rehearsal including reflecting on information, relating it to other known information or forming mental association.
- 4) *Associations*: An effective way to remember information is to associate it with something that is familiar to the student. Connecting to something familiar is a place where analogies, similes and metaphors as well as mnemonic devices are used. Associating the unknown with the known strengthens retention and learning. Another association of information can be in the form of classifying or categorizing data into common themes or attributes. Mapping commonalities can assist students with making the association between pieces of information stronger.
- 5) *Emotion*: Emotion can strongly influence whether the brain initially pays attention. When someone is in a situation where stress is involved, one's memory becomes more vivid. Embedding information with feelings or emotions is a strategy used to retain and learn information.

The development of the Knowledge Banks tool supports much of Wolf’s research. Using technology to help facilitate a library of the brain’s information and understandings supports several of the learning strategies described by Wolf.

Table 2.2 Alignment between the elements of the Knowledge Banks and the key findings identified by Wolf.

Knowledge Bank	Wolf
1) <i>Document Understanding</i> - The developed tool will be a means for documenting information into different formats including graphic organizers.	<i>Associations</i> – To have the ability to draw associations between information will need to be documented in some form.
2) <i>Activate Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior knowledge.	<i>Associations</i> - The purposes of associations are to help draw from prior knowledge and link new knowledge to it.
3) <i>Stimulate Metacognition</i> – Students will have the tool available to revisit understandings and given the ability to verbalize what they have previously learned.	<i>Emotion</i> - Emotion can strongly influence whether the brain initially pays attention. Verbalizing, engaging in conversations, or having the ability to draw from prior information can help students engage their emotions in learning.
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>Chunking</i> – Organizing information into meaningful patterns for enhanced memory.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas	<i>Elaborative Rehearsal</i> – The ability to fully process information includes learning and reviewing information over time.

Note. All five elements are supported by the research in *Brain Matters*.

Principles of Brain/Mind Learning, Caine and Caine

Caine and Caine (2001, 2005) have used brain research to develop a brain/mind principles wheel. This wheel identifies the components needed for the brain to learn. Genetics, experience, culture and many other things affect the brain. The brain is literally learning every

second. Educators find themselves in between the past experiences of teaching and the world of the future. Many times they work and work only to find that student learning is out of their control. There are outside factors that inhibit student's ability to learn.

A review of the principles wheel will describe the many components taken into consideration when teaching. The Knowledge Banks tool does not assist with each and every principle but it does help support several of the needs for brain-based learning. The principles are as follows:

- 1) *All learning is physiological:* Physical movement and engagement of the senses is critical to learning. Traditional teaching with students sitting for long periods of time in desks suggests that the brain is somehow not connected to the body. The mind and the body are parts of the whole and they work in conjunction with each other.
- 2) *The brain/mind is social:* The sense of belonging, being listened to, and being recognized has a big impact on learning. Ignoring the impact of relationships on learning would be a mistake.
- 3) *The search for meaning is innate:* The need to make sense of things is a characteristic of every human being. Trying to make sense of new material helps to organize thoughts and enhances decision-making skills.
- 4) *The search for meaning occurs through patterning:* All human beings are driven by the need to organize, identify and develop patterns that make up their world. Patterning is the meaningful organization and categorization of information. The brain is designed to put information into patterns and discard meaningless information. Effective education is about helping students to recognize patterns and be able to use the patterns as well as communicate the thought processes behind the organizations. Some tools used to help with this organization include using categories to sort detailed information, using analogies to relate the new information to something known, and using metaphor (using one concept to explain another less familiar).
- 5) *Emotions are critical to patterning:* Emotions are a part of every thought, decision, and response. Learning is a process of categorizing information and using emotions to make connections with this information. All senses can be tapped into including visual, audio, touch, and feelings.

- 6) *The brain/mind processes parts and wholes simultaneously:* At any given time the world around us is filled with an infinite amount of information. Making sense of this includes understanding both the big picture and the intricate parts. Teaching begins with exposure to the material, and then the details are placed in context of the bigger whole. All students can learn better if they have a sense of the parts equaling the whole. Traditional education focuses mostly on learning the parts. Although knowing the parts is critical much of this is unclear if there isn't a sense of how the parts fit into the whole.
- 7) *Learning involves both focused attention and peripheral perception:* Paying attention is essential to learning - although learning can occur also in barely conscious states. This is how nuances of cultures are taught. Educators need to tap into students natural need to attend and make decisions. Context plays an important role in teaching.
- 8) *Learning always involves conscious and unconscious processes:* There are layers of consciousness included in learning. Some learning requires conscious attention to a problem or situation. Then some deeper learning can be achieved in an unconscious state or incubation level to process the information - much as the creative inspiration of an artist sometimes occurs after a period of unconscious processing.
- 9) *There are at least two approaches to memory including archiving facts and skills and making sense of experience:* Memory is critical to processing information. There is a great deal of confusion about how memory works. There is a difference between rote memorization of typical facts with no context and experiencing the facts in a deeper type of memorization. This latter type of memorization becomes important in problem solving activities. A lawyer's sense of court cases becomes deepened as these are used to develop an argument.
- 10) *Learning is developmental:* All learning builds on previous learning which occurs as knowledge interacts with experience. All humans develop differently depending on the experiences. In a typical education system, schools categorize students by age, but performance is the best evidence for future learning. Understanding where a student is coming from; what experience or prior knowledge the student has had will assist in teaching the child.

- 11) *Complex learning is enhanced by challenge and inhibited by threat associated with helplessness:* Student learning is affected by the amount of challenge they can undertake and achieve. If students don't have the opportunity to be involved in their own learning environment they experience a sense of learned helplessness - which inhibits students from being able to challenge themselves without the assistance of others.
- 12) *Each brain is uniquely organized:* Every individual has many similarities but even more differences. All humans have their own genetic blueprint. Educators must balance instruction to address the commonalities of all students as well as engage in the individual needs of each student. These individual needs are supported by each individual student's learning styles and their multiple intelligences. These styles and intelligences should be identified and instruction should be adapted for effective instruction.

Table 2.3 Alignment between the elements of the Knowledge Banks and the principles identified by Caine and Caine.

Knowledge Bank	Caine and Caine
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	Documenting information is critical to developing the patterns and organizing information.
2) <i>Activate Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior knowledge.	<i>Learning is developmental</i> - All learning builds on previous learning. This occurs as knowledge interacts with experience. All humans develop differently depending on the experiences.
3) <i>Stimulate Metacognition</i> – Students will have the tool available to revisit understandings. This tool will assist with placing the parts into the whole showing to develop a deeper understanding of the material.	<i>The brain/mind processes parts and wholes simultaneously</i> - At any given time the world around us is filled with an infinite amount of information. Making sense of this includes understanding both the big picture and the intricate parts.
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>The search for meaning occurs through patterning</i> - All human beings are driven by the need to organize, identify and develop patterns that make up their world. Patterning is the meaningful organization

	and categorization of information.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas	<i>The search for meaning is innate:</i> The need to make sense of things is a characteristic of every human being. Trying to make sense of new material helps to organize thoughts and enhances decision-making skills.

Note. All elements of the Knowledge Banks are strongly supported by Caine and Caine.

But Knowledge Banks does not support all elements of the principles of learning.

Completing the Puzzle: The Brain-Compatible Approach to Learning, Eric Jenson

Jenson(1997) provides a comprehensive overview of brain research and how he believes it relates to education. The learning strategies he has derived include all aspects of the human including emotions, patterns, gender differences, nutrition, environments, rhythms, biology, assessment, music, memory and enrichment. The basic premise for his strategies is that we are all natural learners in our own environments. When students are provided with a learning environment that is natural for them to learn they will learn. If we can create an environment that is aligned with how the brain works, then motivation, meaning and recall increase for all learners.

- 1) *Mind – Body – Emotions:* Teachers must develop an awareness of all the things that affect learners including feelings and physical condition as well as cognitive ability.
- 2) *Feelings:* Elicit feelings such as curiosity, suspense, and awe use the brain’s desire to avoid harm. Teachers can get attention by offering ways for students to avoid embarrassment or anxiety. Students must have the ability to express negative feelings before learning. Learning and meaning are driven by feelings.
- 3) *Processing and Awareness:* Learning can take place both consciously and unconsciously. The brain constructs meaning through information that is relevant, emotional, and placed in context of the greater whole. The brain’s quest for learning places information in whatever pattern it can to seek meaning. Patterning information can lead to many Ah-ha moments.

- 4) *Natural Memory*: There is no major filing cabinet for our memory and in fact when a stimulus is given memory is pulled from several areas. The more context clues that can be associated with the memory the better chance it can be recalled. Associating new knowledge with prior knowledge will boost the ability to remember information.
- 5) *Learner Feedback*: The best feedback is immediate, specific and positive. Some types of feedback can stimulate higher levels of thinking. Having learners verbalize their thoughts, do self reviews, encouraging journaling, and correcting their homework and notes can be effective tools for learner feedback.
- 6) *Physics of Influence*: The mind exerts continual “cognitive caresses” on itself. Outside influences can initiate new thoughts effecting organization of thoughts in the mind. Everything in someway is connected and thoughts can have a large effect on students even if words are not attached. Many factors are taken into consideration when absorbing information into the mind including dress, comments, enthusiasm, and values. These are additional influential factors that effect how learning occurs in the mind.
- 7) *Body Clocks*: A person’s short-term memory is more effective in the morning and not as effective in the afternoon. Long-term memory is better in the afternoon. The ultimate clock time for instruction includes variety for presentation times, some in the morning and some in the afternoon to activate both types of memory. It may not always be best for reading to be taught in the mornings.
- 8) *States for Learning*: Two states must be taken into consideration, our thoughts and our physiology. Teachers must pay attention to the state of their learners and use physical and mental challenges to change the states for optimal learning. High challenging, low stress, and attention on learning states all must be present to learn.
- 9) *Biology of Choice*: Instructional environments must take students’ past experiences into consideration. Students need to be able to contribute to be motivated to learn more. Offering students choices gives students more control of their environment and their own learning.
- 10) *Attention*: The brain is biased for novelty and contrast. Be different in your instruction and vary instruction. Get attention for part of the time but don’t keep it all

of the time. Give the brain time to practice, reflect and build the connections for recall in the future.

11) *Biorhythms*: Our physical performance and learning are affected by our biorhythms. Temporal cycles affect humans in many ways including cell division, pulse rate, strength, blood pressure, mood swings, and concentration and learning ability. These cycles can affect memory.

12) *Nonconscious Learning*: Ninety-nine percent of all learning is from the unconscious domain. One might respond to someone’s body language although it is not consciously perceived.

Table 2.4 Alignment between the elements of the Knowledge Banks and the learning strategies by Jensen

Knowledge Bank	Jensen
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	
2) <i>Activate Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior knowledge.	<i>Biology of Choice</i> : Instructional environments must take students past experiences into consideration.
3) <i>Stimulate Metacognition</i> – Students will have the tool available to revisit understandings and rethink their understandings to achieve a deeper understanding.	<i>Physics of Influence</i> : The mind exerts continual “cognitive caresses” on itself. <i>Learner Feedback</i> : The best feedback is immediate, specific and positive. Some types of feedback can stimulate higher levels of thinking. <i>Processing and Awareness</i> : Learning can take place both consciously and unconsciously. The brain constructs meaning through information that is relevant, emotional, and placed in context of the greater whole.
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>Natural Memory</i> : There is no major filing cabinet for our memory and in fact when a stimulus is given memory is pulled from several areas. The more context clues that can be associated with the memory the better chance it has to be recalled. <i>Processing and Awareness</i> : Learning can take place both consciously and unconsciously.

<p>5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas</p>	
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Note. Document understanding and promoting transfer is not strongly supported by

Jensen.

Educational Domain

Mastery Teaching, Madeline Hunter

Education is now more like medicine than ever before. We now know some of the cause and effect relationships between teaching and learning. As a result, we can use this relationship to enhance teaching to increase student learning. Madeline Hunter has identified the key components needed for an effective lesson. She also has looked at the factors needed to achieve maximum learning including student motivation, teaching to both halves of the brain, modeling your expectations, making the material meaningful, checking for understanding and effective practicing. According to Hunter, the factors a teacher must consider when planning every lesson are as follows:

- 1) *Objectives*: The content decision of what to teach begins with finding out what a particular group of students already know. Brain researchers identify this as past experience. Every student comes to us with different experiences and educational background therefore to make a decision about what to teach depends on the prior learning. It is a waste of time to try to teach new concepts that need prior understanding to be learned.
- 2) *Anticipatory Set*: The anticipatory set helps to set the stage for the learning by bringing mental focus on the upcoming activity. During the anticipatory set teachers will have the opportunity to gather prior information from the students helping them to make decisions on how to assist students with building new knowledge. The set will be used to connect information to previous information so students have a place to hang the new knowledge. Teachers will use this step to hook students into learning, tap into students' prior knowledge, identify a place to begin instruction, and give students a glimpse of their previous understanding of the upcoming concepts.
- 3) *Input and Modeling*: To effectively give input, teachers must determine what the basic information is they are trying to teach and organize it a fashion that students can begin to build their scaffold from which to add more complex information. It must be "organized so it constitutes a tapestry of related information rather than a patchwork of bits of information." (Hunter, 2003, p. 48) This knowledge must be presented in a way that shows relationships of the parts as well as to the whole. Information must be presented in

its simplest form and it must fit within the organizational structure devised which might consist of graphic organizers, maps or other organizational tools. Once the information is presented then modeling must occur so students can see what is expected of them. It may include the demonstration of a process, the showing of a product, or modeling the thinking required to perform a task.

Teachers are charged with making material meaningful by sharing experiences or asking for experiences. The brain recognizes patterns and experience builds these patterns. From these patterns, concepts emerge and we can apply these concepts to other situations.

- 4) *Checking for Understanding & Guided Practice*: “To say that you have taught when students haven’t learned is to say you have sold when no one has bought” (Hunter, 2003, p. 76). There are several ways to check for understanding including signaling for answers in which a student signals an answer within the classroom setting, choral responses when the class as a whole responds, individual responses, and more formal assessments using papers, technology or observations of performance.
- 5) *Independent Practice*: There are several different methods of assigning practice. For new learning, practice should be distributed over time. It should include several practice periods over an increased period of time this yields long remembering. Another consideration in practice is to assure that students are practicing correctly. If something is practiced incorrectly then it takes time to relearn the correct method. Feedback is also important on practice. Practicing without letting students know how they have done is a waste of the student’s time.

Table 2.5 Alignment between the elements of the Knowledge Banks and the factors for an effective lesson by Hunter.

Knowledge Bank	Hunter
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	<i>Input and Modeling</i> : To effectively give input, teachers must determine what the basic information is they are trying to teach and organize it a fashion that students can begin to build their scaffolding from which to add more complex information.
2) <i>Activates Prior Knowledge</i> – This tool	<i>Objectives</i> : The content decision of what to

will be accessible to students as a means to find the cues activating prior knowledge.	teach begins with finding out what a particular group of students already know. <i>Anticipatory Set:</i> The anticipatory set helps to set the stage for the learning by bringing mental focus on the upcoming activity.
3) <i>Stimulates Metacognition</i> – Students will have the tool available to revisit understandings and rethink their understandings to achieve a deeper understanding.	
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>Input and Modeling:</i> To effectively give input, teachers must determine what the basic information is they are trying to teach and organize it a fashion that students can begin to build their scaffolding from which to add more complex information.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas	<i>Independent Practice:</i> There are several different methods of assigning practice. For new learning practice should be distributed over time. It should include several practice periods over an increased period of time this yields long remembering.

Note. Stimulates metacognition is not strongly supported by Hunter.

Bloom's Taxonomy

Bloom's Taxonomy was developed for educators to assist in evaluating the educational process. Educators found that emphasis was being placed mostly on the first level of the hierarchy, knowledge. As much as 90% of instructional time is spent on this level with very little time spent on the higher level thinking skills. With the development of the internet and the explosion of knowledge available to consume, emphasis must now be placed on higher mental processes. Blooms hierarchy of learning includes:

- 1) *Knowledge:* Knowledge includes the remembering of facts either by recognition or recall of ideas. The students are expected to store information.
- 2) *Comprehension:* When students are being communicated to about new information, they are expected to make sense of this information using the facts or materials they already know or their past knowledge. Comprehension has been associated with reading but in

this case it is used in a broader sense. Students comprehend information when they are able to translate it into another language or in other terms. They also comprehend with they can interpret the information by reordering or generalizing the ideas. The third way students can comprehend includes extrapolation of knowledge or making estimates or predictions based on the knowledge.

- 3) *Application*: In order for application to occur both knowledge and comprehension must be present. Application is apparent when a student is able to use information in many contexts without being prompted to do so.
- 4) *Analysis*: Analysis emphasize the ability to break down the information into parts and categories then identify the relationships between the parts and how they are organized. Students can develop the ability to distinguish facts from hypotheses, to identify supporting statements and to distinguish relevant material. Analysis includes content, form, and organization.
- 5) *Synthesis*: Synthesis is putting together elements and parts to form another whole, one that could have information and communication from different learning opportunities. This is the area that provides for creation of deep learning on the part of the learner. It is not free creation because the learner works within the parameters of the data learned. Synthesis is a task of great magnitude and requires putting together information from past experiences and learning to present experiences and creating a whole.
- 6) *Evaluation*: Evaluation includes judging the value of the synthesis. These judgments may be either quantitative or qualitative.

Table 2.6 Alignment between the elements of the Knowledge Banks and Bloom’s taxonomy

Knowledge Bank	Bloom and Friends
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	<i>Knowledge</i> - Knowledge includes the remembering of facts either by recognition or recall of ideas. The students are expected to store information.
2) <i>Activates Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior knowledge.	<i>Comprehension</i> - When students are being communicated to they are expected to make sense of it using the facts or materials they know or from their past knowledge.
3) <i>Stimulates Metacognition</i> – Students will have the tool available to revisit	<i>Evaluation</i> - This includes judging the value of the synthesis. These judgments

understandings and rethink their understandings to achieve a deeper understanding.	may be either quantitative or qualitative.
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>Analysis</i> - Analysis emphasizes the ability to breakdown the information into parts and categories then identify the relationships between the parts and how they are organized.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas	<i>Synthesis</i> - Synthesis is putting together elements and parts to form another whole. One that could have information and communication form different learning opportunities.

Note. All five characteristics are supported by Bloom’s Taxonomy.

Instructional Strategies that Work, Robert Marzano

As mentioned above, the art of teaching is quickly becoming the science of teaching. We know more about the brain than ever before and there is more educational research available to study effective practices in teaching and learning. Marzano (2001) has completed a meta-analysis of the past 30 years of educational research and determined the most successful teaching strategies. These strategies can be used to guide classroom practices to enhance student learning.

- 1) *Identifying Similarities and Differences:* Identifying similarities and differences is the core of all learning. These mental operations are the most basic to human thinking. Similarities are drawn and related to other knowledge. Then often times the solutions to problems can become obvious when linked to prior learning. Graphic organizers such as Venn diagrams can be a useful tool to help identify the similarities and differences.
- 2) *Summarizing and Notetaking:* Summarizing information and putting the information in the students own words can enhance learning. Students must be able to delete, keep and substitute information to effectively summarize information. Students must have a deep understanding of the information to do this.
- 3) *Reinforcing Effort and Providing Recognition:* If students believe that effort is directly related to achievement there are positive effects on learning. Strategies can

be used to help students understand that the amount of effort they put into something will yield greater results.

- 4) *Homework and Practice*: Homework can be a very effective strategy as long as the purpose has been identified to the students and they aren't expected to spend too much time on homework because then it can be ineffective.
- 5) *Nonlinguistic Representations*: Nonlinguistic representations will enable students to learn with multisensory stimulation. These can use auditory, tactile, and/or visual stimuli for learning.
- 6) *Cooperative Learning*: Student interaction with each other can enhance student learning. Mixed ability level groups can assist with increased learning from the lower ability students. Each person in the group should have a role and responsibilities to the group.
- 7) *Setting Objectives and Providing Feedback*: Setting a goal for learning sets a direction for learning. Students will focus more on what they are supposed to learn if a clear objective is established. Students will also increase learning if they receive timely feedback.
- 8) *Generating and Testing Hypotheses*: Generating and testing hypothesis involves the application of knowledge. Students should be asked to restate their learning, hypothesis, and conclusions. They should be encouraged to think through their processes.
- 9) *Cues, Questions, and Advanced Organizers*: This strategy is used to help students retrieve what they already know about a subject so new knowledge can be attached to the prior knowledge.

Table 2.7 Alignment between the elements of the Knowledge Banks and the instructional strategies by Marzano

Knowledge Bank	Marzano
1) <i>Document Understanding</i> – The developed tool will be a means for documenting information into different formats including graphic organizers.	<i>Summarizing and Notetaking</i> - Summarizing information and putting the information in the students own words can enhance learning.
2) <i>Activates Prior Knowledge</i> – This tool will be accessible to students as a means to find the cues activating prior	<i>Cues, Questions, and Advanced Organizers</i> - This strategy is used to help students retrieve what they already know about a

knowledge.	subject so new knowledge can be attached to the prior knowledge.
3) <i>Stimulates Metacognition</i> – Students will have the tool available to revisit understandings and rethink their understandings to achieve a deeper understanding.	<i>Generating and Testing Hypotheses</i> - This involves the application of knowledge. Students should be asked to restate their learning, hypothesis, and conclusions.
4) <i>Categorize Information</i> – By placing information into categories of learning that are meaningful to the student, the students will have a greater opportunity of recalling the information.	<i>Identifying Similarities and Differences</i> - This is the core of all learning. These mental operations are the most basic to human thinking. Similarities are drawn and related to other knowledge.
5) <i>Promote Transference of Knowledge</i> from one grade to the next. By capturing the work and notes of the students and placing this work in a searchable format students will have the means to review knowledge from previous years and elaborative rehearsals can be created between grade levels and content areas	

Note. Promoting transfer is not strongly supported by Marzano.

Table 2.8 Comparison between the elements of the Knowledge Banks and the theories that support the elements.

Knowledge Bank	Brain Research Domain				Educational Domain		
	NSF	Wolfe	Caine and Caine	Jensen	Hunter	Blooms	Marzano
1) Document Understanding	X	X	X		X	X	X
2) Activates Prior Knowledge	X	X	X	X	X	X	X
3) Stimulates Metacognition – Information in Context	X	X	X	X		X	X
4) Categorize Information	X	X	X	X	X	X	X
5) Promote Transference of Knowledge from one grade to the next.	X	X	X		X	X	

Table 2.8 shows the breadth of research reviewed and compared with the characteristics of the Knowledge Banks. This table gives an overall picture of how the Knowledge Banks might fit into today’s education. Categorizing information is supported by all the research. Activating prior knowledge and stimulating metacognition is also strongly supported by the research used to support the development of this tool.

Teaching and Learning Tools Available

In this section of the research, each of the characteristics of the Knowledge Banks tool will be discussed. As these are discussed, a review of the tools available for teaching and learning will also be included to show which of these have aspects that would enhance the Knowledge Banks. The characteristics that make the Knowledge Banks tool unique and powerful will also be discussed throughout this section.

Document Understanding: The first characteristic of the Knowledge Banks tool is to document understanding. There will be a variety of ways to document understandings. The actual tool developed uses the graphic organizers recommended by McRel as the most effective tools for the development of vocabulary. The power in the Knowledge Banks tool is the process of being able to link these understandings, categorize the understandings, and connect them with other knowledge. At present, students use productivity tools to present or organize information typically about one topic. These creations are then either printed or shown to a teacher to document knowledge gained. At this point, the files might be saved, they may be trashed, or they may even be saved in a specific file to retrieve later. But the Knowledge Banks tool takes this one step further and offers a way of searching or categorizing the information to represent all of the information thus gathered into a comprehensive model of understanding. As students create and collect, they will then be able to retrieve and rethink the new knowledge over a long period of time.

There are other tools available to document understanding. Several companies have come up with tools to help document knowledge through an on-line portfolio. There are really good methods of using the portfolio information for assessment purposes. Students document or show the knowledge they have gained on a particular subject by creating and developing a portfolio. One such assessment is the MAPS assessment – Managed E-Portfolios. This tool allows teachers to build in assessment tasks and students are able to complete the tasks. One middle school reports, “A good system for assessment [MAPS] now enables pupils’ progress to be tracked effectively so that teachers can assist pupils to improve. Tracking students for improvement is a major reason for the above average standards reached by the pupils” (Thornes, 2004). The function of this tool is to track progress. It does not document, categorize, and

enable students to revisit all learning as it progresses. It is more of a tool for teachers as they assess student learning and not for students to document all learning.

Another tool that documents knowledge is called TaskStream: Tools of Engagement. TaskStream is a web-based tool that is used to organize, assess, and showcase learning. There are eight components in this web-based product that serve specific purposes.

- 1.) The folio assessment and reporting tool: This tool manages all of the assessment information and helps to aggregate individual or group information after the data have been scored.
- 2.) The web folios and web page tool: These sections enable students to create and publish electronic portfolios and web pages from scratch or with a template.
- 3.) The instructional design section enables teachers to enter units and design scoring rubrics so work can be easily shared on-line.
- 4.) The administration and management section assists teachers in monitoring work and shared resources. It includes a method of communication as well.
- 5.) The standards management section gives a detailed report on the standards that have been addressed.
- 6.) The collaborative program is a section that allows participants to access program materials, collaborate online, and submit work for feedback/evaluation.
- 7.) The resource management tool is a teacher tool that helps to organize websites, lessons, and tutorials.
- 8.) The communication section is an instant messenger, e-mail, discussion board and a place for announcements.

While these are all fantastic tools and help for effective teaching, they do not address students' ability to document and make connections among all of their learning by organizing and categorizing new content. TaskStream is more of a management tool for teachers allowing students to participate in assessments, communicate, and view content, but not to manage student learning.

Activates Prior Knowledge: One method used to activate prior knowledge is with the use of graphic organizers and diagrams (Payne, 1996). There are several tools on the market that assist with building understanding through graphics. One tool is called *Inspiration*. *Inspiration* assists students in the ability to represent concepts and relationships while using the outlining

capability to quickly transform these concepts into a linear paper. It is a powerful tool and has an important place in education but after the organizer is complete it is turned in, and possibly saved, but it doesn't have the capability of being recalled as learning continues year after year. A search can be completed to find a file name but it can't be completed by category, curriculum standard, or content enabling students to revisit the information when accessing prior knowledge for new learning to occur.

Another similar tool is called the Cmap Tool – Concept map developed by the Institute for Human and Machine Cognition (IHMC). This tool has some of the same capabilities as *Inspiration*. It enables students to connect concepts together mapping understandings. The unique feature of the Cmap is the ability to store the maps on a worldwide server so others can review the maps and give feedback. Students can go to the Cmap site and create a concept map then save the map and allow other students around the world to log on and review the map. The tool is password protected so students have the option of only letting the people they choose review their maps.

Stimulates Metacognition: The tools listed above are also used to stimulate metacognition. They enable students to rethink their knowledge, make new connections with information, and develop a higher understanding about topics. The ability to use concept maps and think about the information as it relates to other information is an effective way of achieving higher learning. Seeing how pieces of information relate to each other is critical. *Inspiration* and Cmap tools both have this capability. The limit with these tools includes the comprehensiveness of learning. Typically a concept map is used to develop one concept and make connections within this concept. After the concept has been developed and a paper or presentation made, the concept map typically disappears and this concept is never connected with the other learning that occurs. The Knowledge Banks, on the other hand, will allow students to make connections between concepts and well as within concepts.

Another tool that has been developed that helps to illustrate the possibility of connecting concepts continuously is the Visual Thesaurus. The *Visual Thesaurus (1998-2005)* enables a student to continuously move from one term to another making connections continuously along the way. It allows one to explore words and see relationships between words through a web type application. As one enters in a word, a web of other words build around the map that relate to the initial word. Then a student can click on one of the outer terms and it becomes the central

term with other words around it. It allows one to explore and understand the English language in an entirely different way. It creates an atmosphere to begin to understand the relationships between words and meanings. This product is very unique and creates a visual of a possible look for the comprehensive Knowledge Banks, but the aspect that the Knowledge Banks tool will have that the Visual Thesaurus does not is the ability for students to make these connections on their own. The relationships and connections are already created so the students click and view. The power in the Knowledge Banks tool is the ability for students to make these connections on their own achieving higher levels of cognition.

The software behind the Visual Thesaurus that is used by trained personnel to enter content could be a starting point for the Knowledge Banks tool if it was intuitive enough for students to use on a continuous basis. This software is called ThinkMap (2005). It is used as a way of putting content together with connections already established for presentation purposes as well as for discovery purposes as in the Visual Thesaurus. The piece that is missing from this package is the ability to categorize knowledge.

Productivity tools like Microsoft Office also promote meta-cognition. These packages typically include a wordprocessor for typing content, a spreadsheet for developing calculations, and a presentation tool used to produce content for sharing with others. The productivity tool assists students to assimilate information into presentable formats for others to understand and, therefore, stimulates meta-cognition about the presented topic. However, the presented topic is not connected with other content topics.

Another productivity tool is a nonlinear tool called Hyperstudio. This tool enables students to develop in an interactive way a representation of information. Hyperstudio is made up of screens that link together in a variety of ways helping students make connections with information (Sunburst, 2005).

Categorize Information: The only electronic system this research found to categorize information is the management system on a computer. Students can create folders and store files in folders. The new operating system for the MacBook also has the ability to search the content as well.

Promote Transfer of Knowledge: There are tools available to help promote transfer of knowledge within the brain. Concept maps are very powerful at helping students identify their previous knowledge within their schemas. The Frayer Model is used to help students make

connections to prior knowledge. These tools are paper pencil tools and typically are disposed of after the presentation of the new information. The power of the Knowledge Banks tool is in providing a tool to help students organize prior learning through the use of the research based graphic organizers. Then these organizers are stored and at a later date, can act as a stimulus to recognize prior learning and understandings. With the Knowledge Banks tool, a student has the ability to visually recall previous learning not completely depending on what is stored in their individual brain. Perkins (1993) would describe the unstored information as *fragile knowledge*, knowledge that students do not remember therefore they do not understand or actively use. The Knowledge Banks tool would provide a tool to assist students in recognition of previous *fragile knowledge*. Students can then gather more information about this knowledge and thus transforming the *fragile knowledge* into deep understanding.

Other tools available for education include tools such as *Blackboard* and *Moodle*. These are tools used by teachers to organize content and enhance discussions between class members. They have an important role in education but they do serve the same function as the Knowledge Banks. The content is entered by the teacher and not the students. Students are able to hand in information but not to organize and map the knowledge for their own purpose.

Research Supporting Vocabulary Development

There are many uses for the development of the comprehensive tool, the Knowledge Banks, but for the purpose of this dissertation only one portion has been developed, the vocabulary piece. The choice to develop the vocabulary piece stems from the research on reaching the children of poverty. One of the most difficult places to close the achievement gap in education is between students who are economically disadvantaged and students who are economically sound. Recently, a piece of literature has been published that focuses on the need for teaching vocabulary in a systematic way as a strategy to reach the economically disadvantaged. This piece is based on the research from Robert Marzano (2004), *Building Background Knowledge for Academic Achievement*. Marzano completed an extensive meta-analysis of educational research and has organized this research into generalizations for use in schools. His first set of generalizations is included in the study *What Works in Schools*. These are divided into three levels of factors that influence student achievement and they include: school level factors, teacher level factors, and student level factors.

School Level Factors

- Guaranteed and Viable Curriculum
- Challenging Goals and Effective Feedback
- Parental and Community Involvement
- Safe and Orderly Environment
- Collegiality and Professionalism

Teacher Level Factors

- Instructional Strategies (described above)
- Classroom Management
- Curriculum Design

Student Level Factors

- Home Environment
- *Learned Intelligence or Background Knowledge (factor addressed with the vocabulary Knowledge Banks)*
- Motivation

The complete Knowledge Banks tool is supported by the research regarding the most effective instructional strategies as described above. Some of the instructional strategies are also used in effective vocabulary instruction. To begin the discussion on the importance of vocabulary instruction, let us review the research on background knowledge. Then the categories for effective vocabulary instruction will be described and as well as how these categories fit with the vocabulary section of the Knowledge Banks.

Background Knowledge

The amount of background knowledge or what a student already knows about a subject is extremely important in a student's overall education. Schools do not have the opportunity to build this background knowledge from day one but there are strategies that can be used to help students achieve and gain this knowledge. The experiences the students have been given and the encounters with words and books the students have been exposed to are different for every kindergartener that steps into school on the first day.

Marzano (2004), developed a method of interpreting the data on instruction for students in poverty. His findings show that if a student enters school at the 50th percentile in both

background knowledge and academic knowledge, then if the students background knowledge is increased by one standard deviation the academic knowledge is also increased considerably. In contrast, if the student's background knowledge is decreased then academic knowledge is decreased as well. The amount of background knowledge a student has highly affects the ability of the students to learn.

Academic background knowledge affects more than just how well the student will do in school. It has been shown that there is a relation between academic background knowledge and student occupation and "status in life", where "status in life" is defined as the ability to earn more wages. In other words, the higher the academic background knowledge the more financially successful the student becomes.

There are two ways in which a student can acquire background knowledge: 1) by having a superb ability to process information and store it - fluid intelligence (Perkins, 1992) , and 2) the number and frequency of experiences encountered by the student, both environmentally and academically. Schools have little to no control over the fluid intelligence of a student but schools do have some control over the experiences students gain as then encounter information. (Marzano, 2004)

As students enter school, the consequences of poverty become particularly disturbing when the relationship between academic background experience and income is studied. Two studies, the National Longitudinal Survey of Youth and the Infant Health and Development Project (cited in Marzano, 2004), were analyzed and they showed that as the academic background experience decreases so does the income of the family. What can schools do to help the students with limited background knowledge?

Vocabulary knowledge is highly correlated with background knowledge. It is found that children in the first grade that are mid-SES (Socioeconomic Status) know about 4700 more words than children of low-SES. And in fact a correlation of .65 indicates that an increase in a student's family income of one standard deviation will be associated with a 24-percentile point gain in the student's vocabulary development. There is also a relationship between vocabulary knowledge and academic achievement. Children in grades 4 through 12 have shown a 6000-word gap separating students in the 25th and 50th percentiles on standardized tests. These gaps lead us to believe that vocabulary and intelligence are highly correlated. "Clearly, vocabulary knowledge has a strong, documented relationship with a variety of factors that have been shown

to be related to background knowledge, family income or SES, academic achievement, and intelligence” (Marzano, 2004, p. 32).

“[Students of Poverty] have blurred and sweeping perceptions and the lack of a systematic method of exploration” (Payne, 2003, p. 123) meaning they have no specific, predictable way of getting information. They don’t have the cognitive ability or methodology for doing tasks. Their verbal tools are impaired and they do not have the vocabulary needed to internalize learning. With a larger vocabulary, students have the tools to define problems and describe them as well as understand them. If a student does not have specific words to use, then the ability to retrieve information and use information is severely limited. “Vocabulary words are the building blocks of the internal learning structure” (Payne, 2003, p.123)

Direct Instruction

According to Marzano (2004), schools can make a difference in learning for all students particularly students of poverty. Direct vocabulary instruction is the strategy that will make this difference. According to Stahl & Fairbanks, (1986), we should look at two students with equal levels of background knowledge; if one student receives direct instruction on vocabulary and one does not, the student with the instruction has been shown to score at the 62nd percentile while the one without direct instruction in vocabulary is shown to score at the 50th percentile on standard achievement tests, statistically speaking.

In a traditional classroom, vocabulary instruction consists of looking up the words in a dictionary and writing down the definitions. With this type of instruction, the vocabulary words are not committed to long-term memory. Through analyzing the past 30 years of vocabulary instruction, Marzano has identified the characteristics that are seen in the most effective vocabulary instruction programs. They are as follows: (Marzano, 2004):

- 1) *Effective vocabulary instruction does not rely on definitions.* Using definitions is one of the most common ways to teach vocabulary words. Students typically get the terms and look up the definitions and memorize the definitions. For instruction to be effective students must construct their own definition. Students should be asked to elaborate on the definitions given and encouraged to create their own descriptions or explanations of meaning (Paynter, Bodrava & Doty, 2005).

- 2) *Students must use linguistic and nonlinguistic representations to show their knowledge of the words.* Instruction on vocabulary is more effective if students are allowed to use graphic organizers, pictures, or pictograms to identify the word and draw conclusions about the meaning of the word. Greenwood (2004) suggests the following graphic organizers as effective for instruction in vocabulary; the Frayer Model, the Semantic Feature analysis, semantic gradients, word analogies, vocabulary-focused K-W-L tool. Students should be allowed to translate what they have learned about the new word into an image, symbol, graphic organizer, physical representation, or kinesthetic representation (Paynter et al., 2005).
- 3) *Effective vocabulary instruction include multiple exposures to the word in which gradual shaping may occur.* Vocabulary knowledge deepens over time. To fully understand a word students need a variety of exposures and repeated use of the word as they revise their initial understandings. Comprehension of the vocabulary term is greatly enhanced if students interact with this word in several ways including comparing, classifying, and using metaphors and analogies (Marzano, 2004; Paynter et al., 2005). Each new encounter with the word will deepen a student's understanding. Words should be used in meaningful context between 10 and 15 times. "The repetition that occurs incidentally during reading has to be made explicit when teaching critical words and concepts" (Allen, 1999, p. 35). Repeated exposure to new words is important for vocabulary growth (Lubliner, 2005).
- 4) *Teaching the parts of words helps student understanding of vocabulary.* Teaching the roots and the affixes will help student dissect and understand the word (Marzano, 2004). The use of strategies such as derivation of word meaning from context and structural analysis is effective in teaching vocabulary (Lubliner, 2005).
- 5) *Different instruction is required for different types of words.* It is important for students to distinguish between types of words, for instance the differences between nouns and verbs. Then an understanding of the context of the type of word will help with the understanding of that word. E.g. If a student is taught that verbs usually identify a relationship, this understanding will then help students determine their own definitions and understanding of a variety of verbs. When students are introduced to verbs they will know that in most cases it is a relationship therefore beginning with

- this knowledge they can then build their own definitions and understandings for the introduced verb (Marzano, 2004).
- 6) *Discussion enhances understanding by students as they are learning.* When students engage in conversations about the words they are learning they are forming deeper understanding about these words. It also helps students to view things from a different perspective (Marzano, 2004). Thinking and discussing words enlarge students' thinking about language as it relates to events or other words (Allen, 1999).
 - 7) *Playing with the words help students understand.* Games are a powerful tool that will help students to understand words (Marzano, 2004). Playing with words can be interesting to children as well as fun. There are many word games available to help students play with the words (Greenwood, 2004).
 - 8) *Focus on instruction should be on terms that have a high probability of helping students succeed.* Terms should be identified that students will encounter throughout their life but are not words that necessarily are used in wide reading. If schools implement a reading program at a certain grade level, grade level words are regularly used in books that are contained in the new program. The words for the direct instruction are not necessarily words at this level, they are words that all students should know for success in life (Marzano, 2004). Words must be chosen that will merit intensive instruction (Greenwood, 2004).

Vocabulary Portion of the Knowledge Banks

The Knowledge Banks tool will provide the tool necessary to address several of the characteristics listed above in the most effective and efficient manner. As new terms are introduced, students will have the ability to capture that word as well as their own definition within the Knowledge Banks. They will then have the ability to classify and sort the words for a deeper understanding of how they fit into the English language. As words are entered into the Knowledge Banks, students are able to identify the words by the categories within the Bank. Marzano (2004) identified characteristics and semantic features that could be used for sorting words. These categories include: types of people, specific people, natural objects and places, man-made objects and places, man-made events, natural phenomena, intellectual or cognitive products, physical actions, mental actions, social groups or organizations,

shape/direction/position, and quantities/amounts/measurements. Some of these are also subdivided by specific and general terms. The Knowledge Banks tool has the ability to classify words in any way the user wishes in the unit name category.

As students learn more about the words they will have the tool to go back and re-evaluate their understanding about the word. A searching mechanism will be in place for students to search for words when needed in writing or reading therefore giving multiple opportunities to review and use the word for a higher probability of that word being set into long-term memory.

It is also important to learn what the word is like, synonym as well as what the word is not. A variety of graphic organizers were developed to help students pull all of this information together. The graphic organizers are available in the Knowledge Banks tool to make these connections and the information will be stored with the ability to revisit additional times, thus adding to student memory.

CHAPTER 3 - Methodology

The research methodology used in this study will be described in this chapter beginning with an outline of the research and development methodology. A detail description of the research design will continue throughout the chapter.

The purpose of using the research and development cycle was to develop a product that will enhance education (Borg & Gall, 1989). This model bridges the gap between research and practice by developing a research-based product to be used in the practice of teaching. This process was most appropriate for this project because it provided answers to the question being asked, “Can a Knowledge Banks tool be developed that has the potential to assist students in successful vocabulary development?”

Research and Development Methodology

The steps identified by the Teacher Education Program at the Far West Laboratory (cited in Borg & Gall, 1989) include; research and information collecting, planning, development of preliminary product, field testing, product revision, field testing, product revision, field testing, final revision and dissemination and implementation (Borg & Gall, 1989). The problems that have been addressed with this model include the possible expense and time needed to completely develop a product. On the one hand, if steps were taken to develop the initial product fully, sparing no expense, which would call for extensive work; on the other hand, if the product is developed with no funding, the result might be poorly developed materials and not desirable. The resolution to this problem is to put the most effort into the initial development as to make maximum use of the learning principles and less time in the details or extensions of the product. Maximizing the use of learning principles is the recommended methodology for this Research and Development project, as referenced by Borg & Gall. This method calls for giving the essentials the best effort and most time and then doing everything else quickly and cheaply so as to test the learning principles more effectively.

A small-scale research and development process is suggested for a thesis or dissertation. It is suggested to limit the amount of original instructional design of the product and focus on the learning aspects of the product. An example of a small-scale research and development is one

used by Lawrence Cunningham (cited in Borg & Gall, 1989) to develop a history textbook. His design includes the following process; 1) research, 2) plan, 3) development of product prototype, 4) peer review 5) revision of prototype, 6) preliminary field test. This design is one that will be adopted for the purposes of this research. This methodology will allow the researcher to develop and validate a process for vocabulary development while not exhausting both financial and time resources. This research is the catalyst for additional research possibilities as described in Chapter 1 for the expansion to a new way of teaching. From this small-scale R & D project we may glean the information needed to begin the development process of the tool called the Knowledge Banks that will be used for many more applications above and beyond vocabulary development.

Research and Development Procedures

Using the small-scale model or R&D (Borg & Gall, 1989), the researcher developed and revised the vocabulary tool prototype based on the feedback gathered through evaluation. An analysis of the data was used to make revisions on the product prior to final field-testing. The R & D model used the following seven phases:

Phase 1: Research

Through the literature review a need was established for this tool by reviewing the key aspects of the Knowledge Banks, the recommended best practices with regards to current brain research, well-known educational theories, and the recommended method of vocabulary instruction. The research completed in the literature review also initiated the process for design of the product. Other products were viewed that were similar in nature without the same components to begin product design.

1. The research for the literature review established a need for this product and began the process of product design. Figure 2.1 reviews the support for the components of the Knowledge Banks tool through the lens of brain research and educational practices. The following section of the literature review describes the tools available today and how they support the components of the Knowledge Banks tool as well as what is missing. Identifying the tools available establishes the need by showing that the components are applicable and important but there is not a piece of software available with all of the

components that the Knowledge Banks tool supports. Additional research was discussed as product development was described for design elements, usability, and features.

2. The tools developed by McRel (Marzano, 2004) for effective vocabulary development and filters were researched and tools were designed for the prototype developed. These were available for students to use in mapping their understanding of different vocabulary words. The filters represented graphic organizers that are considered to be best practice for vocabulary development as described by Marzano.
3. The layout and design of the prototype was designed based on the research in the literature review as well as other research of the other available tools to assure a clear and user-friendly environment. Experts from McRel were interviewed to assist with the initial design of the product. These experts were involved in research on vocabulary practices and understand of the effectiveness of the vocabulary tools. These experts trained the four teachers involved in the initial phase of product testing.

Phase 2: Plan

The purpose of this step was to use the research from phase 1 above to determine a plan for development of the prototype. The information collected in the research phase helped to guide decisions about the following.

1. What are the features of a productivity tool that would best fit the needs of the vocabulary prototype?
2. Would this be more effective as an online tool or a tool on the local drives on computers or hand held devices?
3. What aesthetic structure will produce the most clear and user-friendly environment for students to use?

Phase 3: Development of the Prototype

Based on data gathered in phase 1 and phase 2, a preliminary prototype was developed. This prototype was used as a visual for teachers and students to view as they determined if a tool could be developed to assist with vocabulary development. The prototype gave a means for review to assist in the discussions needed to answer the research question.

The purpose of this phase 3 was to determine whether the vocabulary prototype supports the research on effective practice for vocabulary development. A team of four high school

teachers were called upon to review the preliminary product for functionality in their classrooms in a hypothetical stance. In Kansas' schools there are four core content areas identified: communications, mathematics, science, and social studies. Therefore, this study selected four teachers to participate that were associated with these four core content areas. Vocabulary instruction is vital in all content areas. Included were a communications teacher, mathematics teacher, science teacher, and a social studies teacher. These teachers are all licensed teachers in these content areas through the Kansas State Board of Education. They are considered experts in their content area and have been extensively trained by Mid-Continent Regional Educational Laboratory (McREL) on the vocabulary strategies proposed by Marzano as seen in the literature review. Teachers in this district are required to implement the strategies that fit their content area and collect evidence demonstrating the use of the strategies, which are then placed in an evidence notebook. The four teachers were selected by reviewing the evidence document to determine if they had experience with teaching vocabulary using graphic organizers in paper/pencil form.

Teachers signed the permission forms in Appendix A and gave them to the researcher. The teachers then reviewed the vocabulary prototype as well as a PowerPoint showing the possible expansion of the prototype into the full Knowledge Banks. A survey tool (Appendix B) was developed and given to the teachers to gather data determining if they believed that such a tool would be effective to help with vocabulary instruction. Questions were asked on what changes they felt would make the prototype more effective. The focus group was recorded and the transcription is located in the Appendix C.

Another peer review was completed with students. Students were selected purposefully by the four teachers who participated in the initial peer review. Teachers were asked to recommend students with a variety of academic success, different ethnicities, different grade levels, and also students who would give feedback when asked. Each of the four teachers recommended four students to participate in the review. These 16 students were personally invited to review the tool for recommendations in changes and usefulness. Seven students attended the focus group. Permission Forms (Appendix E) were collected by the researcher. Then students viewed both the vocabulary prototype and then also the PowerPoint designed to show the Knowledge Banks tool in its expanded version. Students were asked questions (Appendix F) and their answers were recorded. The transcriptions of the conversation appear in

Appendix G. These recommendations were used to develop the tool further for success in the preliminary field test.

Phase 5: Revision of the Prototype

This phase included the revision of the prototype based on the recommendations from the peer reviews.

Phase 6: Preliminary Field Test

The purpose of this next phase was to allow the students to use the prototype in a classroom situation. The group of seven students that originally participated in the peer review were asked to participate in training regarding the use of the prototype and then asked to use the prototype in their classes. Of the seven students, one student dropped from the high school and four students showed up for the training. These four students were given a computer to use for a week and then they were asked to participate in a focus group. They reviewed the product for functionality in use and assistance with vocabulary development. Questions were asked and the conversation was recorded. The transcription is located in Appendix G. These students are active learners and represent the population that will be targeted for this product.

Phase 7: Final Revision

Final revisions were made based on the data gathered from the students.

Data Collection and Analysis Procedures

Collected data was recorded, categorized, interpreted, and analyzed using the following qualitative procedures:

1- Collecting Data

Phase 4: Peer Review: The data collected in this phase included two parts. 1) Surveys asking information about each component in the product were completed. Details were gathered about the use of the prototype, the interface of the prototype, and the functionality of the prototype in a classroom setting. The surveys were developed to guide the developer into the revision process before using the tool with students. 2) Teachers and students participated in a focus group to obtain additional information about directions in which they would like to see the

product move. Questions were asked to determine ways to enhance the product. Information was also solicited regarding the use of the entire Knowledge Banks.

Phase 5: Revisions to the Vocabulary tool were made based on the limitations of this study and the information obtained in the focus groups.

Phase 6: Preliminary Field Test: The data collected in this phase consisted of two parts. 1) The actual student Knowledge Banks were used as data. These were analyzed for use with new vocabulary as students participated in the field testing phase of the project. The tools were analyzed for use and each function of the prototype was reviewed to determine ease of use and how the students used them. 2) Students participated in a final focus group to determine the use of the Knowledge Banks and the thoughts regarding use in vocabulary development and ideas for enhancement. This information was analyzed and used to determine the need and use for the tool as well as make final improvements to the tool.

2- Recording and Categorization of Data

Survey information, focus groups, and Knowledge Banks data was recorded and categorized for analysis. Teacher and student peer review data was used to make adjustments to the product and preliminary field test data was used to make additional adjustments but also to determine in a tentative and preliminary basis if the tool can be used for successful vocabulary development. Framing questions for the teachers included:

- 1) would teachers use such a tool with teaching vocabulary,
- 2) what feature make the tool valuable,
- 3) what aesthetic feature would make the tool more usable,
- 4) would it assist students in maintaining and learning new vocabulary,
- 5) would the Knowledge Banks tool promote transfer of knowledge across grade levels and content areas,
- 6) would the Knowledge Banks tool change the way you teach?

Framing questions for the students included:

- 1) what aesthetic features would make the tool more useable,
- 2) would the tool assist students in maintaining and learning new vocabulary,
- 3) would the Knowledge Banks tool promote transfer of knowledge across grade levels and content areas, and

- 4) would the Knowledge Banks tool concept change the way you learn. Both groups will be asked about the implication of expanding the development of the vocabulary tool into the more comprehensive Knowledge Banks.

3- Reduction and interpretation

The researcher sorted, selected and organized the raw data so specific conclusions can be made to enhance the Vocabulary tool. Action was then taken to transform the tool into a knowledge-enhancing tool after the preliminary field test.

4- Test the finding

The researcher tested the product with the intended population, the students. Data was collected to confirm and test the findings.

5- Apply the finding

Following the peer review and the preliminary field test process and analysis of the data, the identified changes were applied to the product keeping in mind the limitations of the researcher both technically and financially.

The Researcher's Role

The goal of the researcher was to gain information about the effectiveness of the developed tool in vocabulary development. This process included talking with teachers and students while encouraging their open and honest opinion about the use of the vocabulary tool. The researcher assured the teachers and students that their evaluation or grades would not be effected by their input. Both negative and positive opinions were welcomed in order to create the most effective tool to enhance students learning of vocabulary.

After the research was completed, students were asked if they felt comfortable talking honestly about the product or if they felt compelled to answer questions a certain way because of the presence of the researcher. They did not feel threatened by the researcher because the researcher's position in the district is removed directly from the school and is housed in the central office. Even though the students knew who the researcher was they didn't feel as though she would have a direct impact on their grades or their success in school. Students knew that

their feedback about the product both negative and positive was used to make the product more useable for them and to determine if such a product would help them in learning.

Students expressed concerns and suggestions during the focus group and discussed with the focus group things they would like to see. These ideas were used to enhance the product. Students saw the use of their suggestions when they participated in the preliminary field test. Many of the changes made were based on the suggestions from the students.

Teachers were asked if the presence of the researcher had any bearing on the feedback given. Teachers understood that it was their expertise that got them invited to participate and they felt that the information they shared had no effect on their job. In fact, they felt validated by even being asked to participate. Teachers did share concerns and suggestions about the tool openly and the information they shared helped the researcher develop the prototype even further. Teachers will get a chance to see the final product when the researcher shares the results with the teachers.

The researchers role also included technical support as the tool is being implemented in the classrooms. Students were trained on how to use the tool and were assured that if any technical issues arose they can approach the researcher to assist them. They understood the role they played as field tester and the researcher assisted them in this process.

Sharing Results

Results were shared with both the students and teachers by means of an open house. Participants were invited to see the final product as well hear about the final results of the focus groups. The abstract was handed out to the participants and the complete project was made available to view. The superintendent of the research school as well as the board members were invited to participate and see the final product.

CHAPTER 4 - Interpretations and Product Revisions

This chapter begins with; a description of the initial vocabulary tool developed that was used for the peer review from both the teachers and the students, the interpretations of the results of the peer reviews, the revisions made, a description of the revised version of the prototype for the preliminary field test, and the final results of the preliminary field test.

This chapter will present the information gathered to try to answer the following question and sub questions.

Can a Knowledge Banks tool be developed that has the potential to assist students in successful vocabulary development?

- a. Would teachers use such a tool with teaching vocabulary and reviewing vocabulary?
- b. According to teachers of different content areas, what features would make the tool valuable?
- c. What aesthetic features would make the tool more useable?
- d. According to teachers and students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?
- e. According to teachers and students, would expanding the Knowledge Banks tool to all areas of instruction be useful in promoting transfer of knowledge across grade levels and content areas?
- f. According to teachers, how would the use of the entire Knowledge Banks change the way you teach?
- g. According to students, would the use of the entire Knowledge Banks concept change the way you learn?

The sub questions were geared toward the two different populations in the study, teachers and students. Not all of the questions were answered by each of two populations. Table 4.1 identifies which population(s) will be used to answer the particular subquestions leading to the answer to the overall research question.

Description of Vocabulary Prototype

The initial prototype for peer review began with the main menu. The main menu included the initial setting of the name of the student and the grade level as well as the ability to change the current subject on an hourly basis. The name and grade automatically fills in throughout the insertion of new words.

Figure 4.1 Main Menu of the Knowledge Banks

Welcome to your Vocabulary Knowledge Bank

Please enter or verify the personal information below

First Name	Denise
Last Name	Guy
Current Grade Level	II
Current Subject	Communications

This tool is used to collect the words you are learning so you can refer back to them and use them in other classes and at other times. Choose the vocabulary strategy you would like to use to enter your vocabulary or the action that you would like to accomplish.

Vocabulary Tool	Action
Concept Map	Search by term
Frayer Model	Search by Content Area
Definition Word Map	Search by Grade level
	Search by Grade Level and Content Area
	Search by Date Entered for Printing

The main menu in Figure 4.1 includes the ability to select a graphic organizer to use while learning more about a word. The graphic organizers have a variety of fields available for students to enter information that will assist them in learning the vocabulary term. Students can

also choose to search the Knowledge Banks in variety of ways, sorting and classifying information. Students also have the option of navigating to other windows and there is always the option to return to the main menu.

Students are then able to select the vocabulary tool they wish to use:

- 1) Concept Map (Figure 4.2)
- 2) Frayer Model (Figure 4.3)
- 3) Definition Word Map (Figure 4.4)

The Concept Map (Figure 4.2) has several places for students to enter their information about the word they are studying. Each map asks the students to analyze a word's definition, create examples using word, and describe what the word is like. These categories allow the students to think through the word very carefully and activate their prior knowledge about the word.

Figure 4.2 Concept Map

The screenshot shows a web-based interface for a Concept Map. At the top, there are two buttons: "Main Menu" on the left and "New Word" on the right. The main content area is a light gray box with a dotted border. It contains several input fields and labels:

- A large rectangular input field at the top left, labeled "What is it? Definition" above it.
- A smaller rectangular input field on the right side, labeled "What is it like?" above it.
- A rectangular input field in the center, labeled "The Word" to its left.
- Three small rectangular input fields arranged horizontally at the bottom, labeled "What are some examples?" below them.
- A small date stamp "7/30/2006" in the bottom right corner.

The Freyer Model (Figure 4.3) has some of the same categories as the Concept map. The concept is centered in the middle and the students again enter in a definition, characteristics and examples, but this model also asks for some non-examples as well.

Figure 4.3 Freyer Model

Main Menu		New Word	
Definition	Characteristics		
Examples	Non Examples	7/30/2006	

The Definition Word Map (Figure 4.4) includes all of the information in the Frayer Model but it also asks students to use the word in a sentence. By putting the word in a sentence, students are building a context clue for the word. Sometimes words have multiple meanings and putting the word in a sentence narrows the meaning.

Figure 4.4 Definition Word Map

Main Menu		New Word	
Vocab Word		Use the word in a sentence	
<input type="text"/>		<input type="text"/>	
Definition	<input type="text"/>		
Examples	<input type="text"/>		
Non Examples	<input type="text"/>		
7/30/2008			

The concept map, Frayer model, and the definition word chart are some of the recommended tools for teaching vocabulary by Marzano (2004). These tools are also a part of a vocabulary initiative at the high school where the teachers and students participating in this research teach and attend school. The other options in the main menu (Figure 4.1) include the ability to search the tool for specific information. There are several choices on the main menu including searching by term, grade level, content area, and date. When students click on one of the search menus, a screen appears that allows students to type in the word (Figure 4.5).

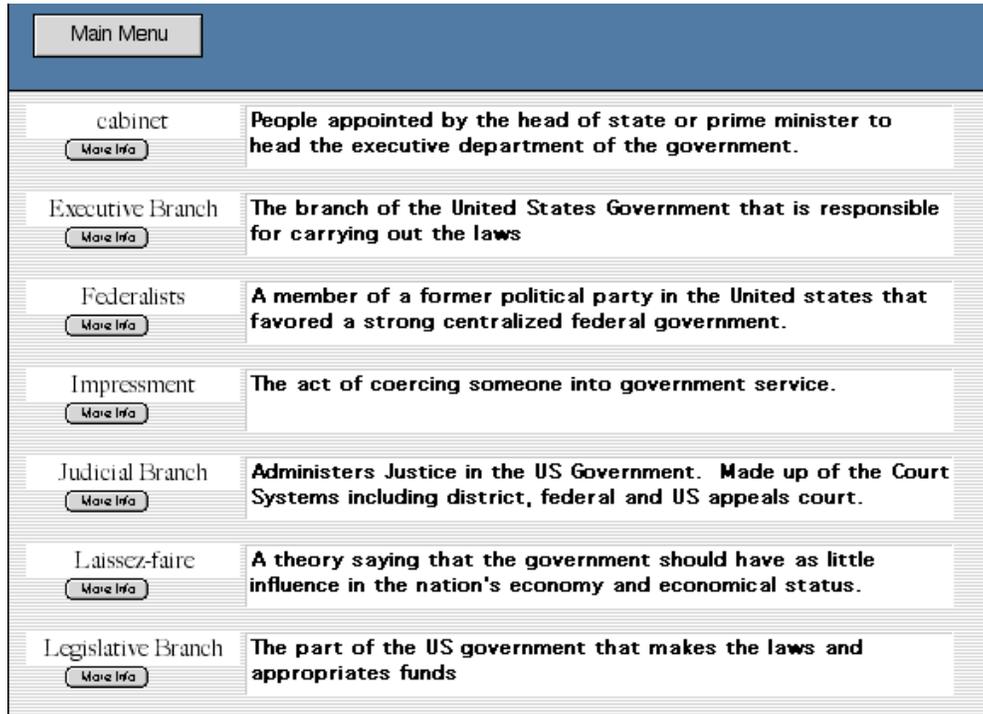
Figure 4.5 Search menu for a specific term

Search for which word
government

The following demonstrates the searching ability of the Knowledge Banks. After the student types in the word, government, and clicks find, the Knowledge Banks will find the term government in all fields except the non-examples and made up sentences.

Students then will be directed to a return screen to show where government is in all of the records (Figure 4.6).

Figure 4.6 Return screen for search



Main Menu	
cabinet More Info	People appointed by the head of state or prime minister to head the executive department of the government.
Executive Branch More Info	The branch of the United States Government that is responsible for carrying out the laws
Federalists More Info	A member of a former political party in the United states that favored a strong centralized federal government.
Impressment More Info	The act of coercing someone into government service.
Judicial Branch More Info	Administers Justice in the US Government. Made up of the Court Systems including district, federal and US appeals court.
Laissez-faire More Info	A theory saying that the government should have as little influence in the nation's economy and economical status.
Legislative Branch More Info	The part of the US government that makes the laws and appropriates funds

Students can then click on “more info” on any term they wish and see the record in its entirety (Figure 4.7). Students can update this information for new meanings, change for new understandings or add to it. So any vocabulary record that is related to the term typed into the search field will be available to be viewed by the student. This will allow students to make connections between terms and definitions.

Figure 4.7 The More Info results

The screenshot shows a web interface with a blue header bar containing a 'Main Menu' button. Below the header, there is a search result for 'Compromise'. On the left side of the result, there is a 'back to search' button. The main content area is divided into sections: 'Compromise' with a definition, 'Same As' with a description, 'Examples' with a list of terms, and 'Facts' with empty input fields. At the bottom of the interface, there are several input fields: 'Subject Area' with the value 'Social Studies', 'School Year' with the value '11', and a date field with the value '5/11/2006'.

Questions for Peer Review

The sub questions used to frame the research questions were used to categorize information obtained in the peer reviews. The following sub questions have been identified specifically. These questions will help to synthesize the information gathered in the focus groups and assist with sorting the comments from each group making sense of them for interpretation of the data obtained. The sub questions are identified in the first column of Table 4.1 and the population for which the question was used for classification purposes is identified on row 1 of Table 4.1. This organizational structure was used to answer the framing questions which ultimately helped to answer the research question.

Table 4.1 Identification of the sub questions being answered by the different populations within the study.

Sub question	Teachers Peer Review Focus Group	Students Peer Review Focus Group	Students Preliminary Field Test Focus Group
a. Would teachers use such a tool with teaching vocabulary and reviewing vocabulary?	X		
b. According to teachers of different content areas, what features would make the tool valuable?	X		
c. What aesthetic features would make the tool more useable?	X	X	X
d. According to teachers and students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?	X	X	X
e. Would expanding the Knowledge Banks to all areas of instruction be useful in promoting transfer of knowledge across grade levels and content areas?	X	X	
f. How would the use of the entire Knowledge Banks change the way you teach?	X		
g. Would the entire Knowledge Banks concept change the way you learn?		X	

Peer review results from teacher focus group and teacher survey

Procedure

The teacher focus group was completed on a Saturday morning to avoid school day stress and complications. It was completed after the initial tool was developed. The tool was used for demonstration purposes for the teachers to assist in gathering their feedback on the effectiveness of such a tool.



The four teachers were invited for breakfast and a discussion. The teachers consisted of: a white female English teacher 50 years of age, with 20 years of teaching experience; a white male math teacher 33 years of age with 11 years of teaching experience; a white, male social studies teacher of 35 years of age with 12 years of teaching experience; and a white

female science teacher 28 years of age with 7 years of teaching experience. The teachers were selected because of their extended use of the tools initiated by *Classroom Instruction that Works*. These teachers are teachers in their field well-respected by their principal and superintendent. They are the curriculum leader for their content area for their school. All of the teachers have been engaged in teaching vocabulary in the courses they teach. Three of the four teachers have recently received their MS in educational technology, and are very knowledgeable and open to using a technology tool in their classroom.

The focus group began with a description of the overall vision for the entire Knowledge Banks tool concept and then of the vocabulary prototype. This was developed for just the vocabulary portion of the Knowledge Banks. After the description was given questions were asked to drive the conversation in the direction needed to answer the research questions. The results of the focus group are presented in the following tables throughout this chapter.

Teachers were also given a survey for which to respond anonymously to allow them to give feedback without the watchful eye of the researcher. They were given the survey and asked to place it in the school mail and deliver it to the researcher in an unmarked envelope. These results are also presented in this chapter.

Results

Sub question a.

Would teachers use such a tool with teaching vocabulary and reviewing vocabulary?

Table 4.2 Comments by teachers about Research for sub question a

<i>Comments about Research for sub question a.</i>	<i>Content area/lines in Appendix C</i>
<p><i>Regarding vocabulary development....</i> "We're doing better at that in the math department but I mean that's really hard because when you have the possibility of 3-4 different Algebra I teachers it's really kind of hard to figure out what was done and to what extent. And the other thing is that things pop up and they don't really get more than a week or two to absorb it by the time they get to me they don't remember they ever did it."</p>	<p>Math Lines 264 – 269</p>
<p>"First semester when I did Vocab, I worked pretty hard at doing that but it wasn't seamless. It always felt like it was forced and out of context so I've done nothing with vocab second semester just because it frustrated me so much that it was just never seamless. So if someone could create that magic, seamless way of integrating it. A(Math) is right they know a lot more than they think. They'll say Mr. X never talked about that when I know he talked about it. It's just getting them to recognize it and those concepts again. Doing that in the framework of your lesson plans would be huge."</p>	<p>Social Studies Lines 365 - 372</p>
<p>"I could see, I could see all of my students sitting there with a computer and not a paper and pencil and taking their notes on their computer and then three or four weeks from then being able to tap into those notes again."</p>	<p>Math Lines 373 - 375</p>
<p>"Yeah, all of our notes are on the computer, they(students) keep them in a folder and it's a pain going back to those. They all save it under a different name and but if you could instantly click in to a database and have that stuff be there, that would be great?"</p>	<p>Social Studies Lines 379-382</p>
<p>"I believe that it's an awesome concept to be able to carry that with you year after year because you're right they just end up pitching the notebook. They never know if they'll need to refer back some day. I've saved some of my college notes and I've even referred back to those teachers because I thought it was a valuable course and was pertinent to my subject area but you know you just never know. And to be able to have it right in one spot, to be able to type in and click and go would be great."</p>	<p>Science Lines 463 - 468</p>

Overall, teachers appreciated the idea of having the information from the students past education available to be viewed at any time. Teachers understood that students don't always remember what they have been taught in the past and they felt this is a tool that could help students get to their prior knowledge. Teachers said they would use the tool if it was seamless and they felt that the searching component is critical for functionality and use. Having all of the data together in one spot to refer back to it in the future makes the tool valuable.

Teachers were asked on the teacher survey (Appendix D) if they would use this tool in their classrooms. On a 4 point scale the average was a 3.75 with 1 being they would not use the tool and 4 being they would use the tool.

Sub question b.

According to teachers of different content areas, what features would make this (vocabulary) tool valuable?

Table 4.3 Comments by teachers about Research for sub question b

<i>Comments about Research for sub question b.</i>	<i>Content area/lines in Appendix C</i>
“I believe that it’s an awesome concept to be able to carry that with you year after year because your right they just end up pitching the notebook. They never know if they’ll need to refer back some day. I’ve saved some of my college notes and I’ve even referred back to those teachers because I thought it was a valuable course and was pertinent to my subject area but you know you just never know. And to be able to have it right in one spot, to be able to type in and click and go would be great.”	Science Lines 463 – 468
“I think it would if they had a bank then you could say well type in and see” “It’s also pretty easy to say I don’t remember ever seeing that”	Math Line 271 & 276
“I like the potential of the students to be able to make connections from one year to the next. I know that’s an issue in social studies but it is also an issue in math. They don’t connect algebra and geometry very well unless we paint them a picture and if they’d have the capabilities to cross them over that would be great”	Math Lines 335 – 338
“ And even between buildings, you know, I mean I don’t know down to the day what the middle school science teachers but I do know concepts they cover then when they have me they claim we’ve never done that and I know that’s not true at least it’s been introduced to them. I go a little deeper obviously but you know to be	Science Lines 339 – 242

able to say hey yeah you have to call it up”	
“Research paper items when students claim they’ve never done it when you know that Mrs. P makes them do it you’d be able to have them find it”	Social Studies Lines 344 – 345
“It might be the best way to help kids make connections we haven’t found a way yet”	English Lines 363 - 364

Some teachers believe the vocabulary tool is valuable because of its ability to transfer the information from one year to the next and to be able to build on terms that were previously introduced and now are being learned in more depth. The ability to take the information or terms to other classrooms and use them in other contexts is also another way that some teachers believe this tool would be valuable. The ability to connect information between content areas and between schools, some teachers believe makes this tool valuable.

Sub question c.

What aesthetic features would make the tool more useable?

Table 4.4 Comments from teachers about Research for sub question c

<i>Comments about Research for sub question c.</i>	<i>Content area/lines in Appendix C</i>
“When we use Frayer Model in our examples and non examples we do that a lot by picture. We draw a picture of an example and a picture of a non-example and it focuses on the vocabulary.”	Math Lines 186-188
“I might draw DNA”	Science Line 195
“The paras that work with my LD students they do all of their vocabulary by nonlinguistic representations”	English Lines 197 - 198
“Especially when you are talking about what is an example and what is a non-example. There is always going to be a textbook definition and some characteristics that you can verbally put but students learn well from the non-linguistic pictures. It keeps it fresh.”	Math Lines 201-204
“Well especially with the more abstract concepts, you know like photosynthesis, they can’t picture that so it helps if they can see it and draw it.”	Science Lines 205-206
“.....non linguistic thing in which they draw picture”	English Lines 229 – 230
“....like the drawing capabilities”	Science Line 291
“I would think you would have to have, like you said earlier, you don’t have the time, money, or, but I’d think you’d have to have	Math Lines 314-316

some types of drawing, sketching, or something they could draw.	
“Or the ability to grab a picture off of the internet and put it on there”	Science Line 319
“All of our combo notes we’ve had to go to our Power Point program and drag pre-existing pictures. It’s alright but it’s kind of nice to let kids create their own pictures too.”	Social Studies Lines 418 - 420
“Inspiration type...I don’t know what the appropriate term is for it but...categorizing something by the thing that fall under it. Flowchart like thing”	Math Lines 211 – 212
“ I like webbing”	Math Line 245
“...I do a lot of analogies. Helps them grasp things onto something concrete that they know and they can make a relationship to something they know”	Science Lines 219 – 221
“ I adapt on my Frayer models, I don’t use all the same categories. I change names and heading and figure whatever works for the students. If they did it over snakes what is a non-example...they could put anything”	Science Lines 235 – 237
“ I am such a modifier like when we do Frayer models my boxes are different you know they are different from Biology vs. Zoology. I use the definition word chart but mine is a little different.”	Science Lines 285 - 287
“Be able to modify a little bit”	Math Line 292
“Have a zoology template and they could click on that or something”	Science Line 293
“And I would think you would want some type of graphing capability”	Math Line 320
“I don’t have anything particularly against websurfing or MSN but it takes the focus away from what they are learning. You know...whatever they did with the Kansas Assessment you’d want to do something like this”	Math Lines 435 - 437

Several teachers agreed that the presence of drawing capabilities is a feature that would make this tool much more viable because students could represent information visually as well as linguistically. Teachers also mentioned the ability to graph, particularly for math would make the Knowledge Banks tool more valuable. Adjusting the information gathered was also something that some teachers believed would be a valuable part of the tool, as would the ability to vary the information that is gathered from the student. An *Inspiration* type web, they thought, would also be useful in the vocabulary tool. Another idea they gave for additional features is the ability to lock students out of everything but the Knowledge Banks tool, so the focus can be on what they are doing with the bank.

Sub question d.

According to teachers and students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?

Table 4.5 Comments from teachers about Research for sub question d

<i>Comments about Research for sub question d.</i>	<i>Content area/lines in Appendix C</i>
“I think it would [refresh their memories] if they had a bank then you could say well type in and see.”	Math Line 271
“I could see were for literary terms that could be useful for our area because those are the things from Freshman, sophomore, junior, and senior. Those definitions don’t change and they could go back and while the freshman don’t get as advanced as the juniors they still use the same ones they could go back and..”	English Lines 272 - 275
“Well if they wanted to let’s say they could go zoology and they had a whole word bank of zoology terms”	Science Lines 278 – 279
“I think you’d grab a higher percentage of the students....”	Math Line 474

The ability for students to have a tool to use to refresh their memories about vocabulary, some teachers believe will assist students in maintaining and learning a new vocabulary. Also the ability to use the tool year after year and build on the terms as teachers go more deeply into the terms, some teachers believe would help students learn new vocabulary terms. Students would be able to type in a general term and be able to see all of the terms related which might assist a higher percentage of students in learning vocabulary.

Teachers were asked on a survey (Appendix D) if the Knowledge Banks vocabulary tool would assist students in learning vocabulary. On a 4-point scale the average was a 4, where a 1 means it would not assist students and a 4 means it would assist students. They were also asked if they felt the vocabulary tool would assist students in maintaining the use of new vocabulary terms. On a 4-point scale the average was a 4, where a 1 means it would not assist students and a 4 means it would assist students.

Sub question e.

Would expanding the Knowledge Banks to all areas of instruction be useful in promoting transfer of knowledge across grade levels and content areas?

Table 4.6 Comments from teachers about Research for sub question e.

<i>Highlight of comments about Research for sub question e.</i>	<i>Content area/lines in Appendix C</i>
“Yes, I think for integration purposes it could be nice because we could click into the social studies and this is what you’ve talked about and how this novel fits. That would be a great integration tool”	English Lines 346 – 348
“We are talking about the Red Scare on Monday and it could be connected to the Crucible that is done in your class”	Social Studies Lines 349 – 350
“Even if we use that info daily with a two year gap between World History and American History they loose it. They loose it just in one year when they get to Government from my class. I’ve told X that we’ve talked about that stuff a lot but they don’t remember it.”	Social Studies Lines 476 – 479

This question expands on question a. Some teachers believed it would be useful in all areas of education for integration within different content areas. The social studies and English teachers discussed ways in which they could build on each other’s content in a more dynamic way if they could have students refer to the Knowledge Banks tool as they are learning new content. They also believed that it would assist the ability of students to revisit information so they can build on it year after year.

The teacher survey (Appendix D) asked if the Knowledge Banks would assist students in maintaining new knowledge across grade levels. On a 4-point scale the average was a 4, where a 1 means it would not assist students and a 4 means it would assist students.

Sub question f.

How would the use of the entire Knowledge Banks change the way you teach?

Table 4.7 Comments from teachers about Research for sub question f

<i>Comments about Research for sub question f.</i>	<i>Content area/lines in Appendix C</i>
“Yes, I think for integration purposes it could be nice because we could click into the social studies and this is what you’ve talked about and how this novel fits. That would be a great integration tool”	English Lines 346 – 348
“Unbelievable tool, it would take some trial and error to find the most effective way to use it. I like the idea of a color scheme too. You can make the visual connections	Social Studies Lines 333-334
“We are talking about the Red Scare on Monday and it could be connected to the Crucible that is done in your class”	Social Studies Lines 349 – 350
I think what X says that it would take a little trial and error and you’d have to see exactly how it would fit and where you would use it. I can’t really say right off the bat this is where it would plug in. I would and it would be nice just to be able to at first tell the students like X said earlier, hey key it in. Look it up on your word definition bank.	Science Lines 352 – 356
“Lets see what kind of background knowledge you have coming into it, I mean, you could even in some of these situations, teachers might be able to let the students do the entire lesson if you, if you tap into the background knowledge and say what have you done with this and what did you learn at the time, I mean, when you get through all of that you might have your lesson almost out there	Math Lines 357 – 362
“I could see, I could see all of my students sitting there with a computer and not a paper and pencil and taking their notes on their computer and then three or four weeks from then being able to tap into those notes again.	Math Lines 365 - 375

One of the teachers believed this would be an unbelievable tool to help them teach students. He felt it would take some trial and error on learning the best way to use the tool. Overall, teachers were excited about the possibility of having students be able to connect new information with old and to activate prior knowledge.

Teachers were asked if they would use the Knowledge Banks if all students had a computer. On a 4-point scale the average was a 3.75, where a 1 means they would not use the tool and a 4 means they would use the tool.

Peer review results from student focus groups

Procedure

A purposeful group was gathered for student input on the prototype of the Knowledge Banks. The teachers involved in the study recommended four students from their classrooms to be involved in the student focus group. Sixteen students were invited to be involved in the focus group and seven students actually showed up the day of the focus group. The seven students consisted of four females and three male students. There were two Hispanic students, one black student, and four Caucasian students. One of the seven students involved in the focus group receive free lunches. The other six students pay fully for their lunches. The average GPA of the students is 3.59. All students' GPA were 3.0 or above.

Students were invited to participate in the group during their seminar. Parental permission forms were collected by the researcher prior to beginning the research. The students went to the library for the activity and the researcher began with the reasoning behind the focus group. The sub questions to be answered by the student focus group are identified on Table 4.1.

Results from Student Peer Review

Sub question c.

What aesthetic features would make the tool more useable?

Table 4.8 Comments from students about Research for sub question c

<i>Comments about Research for sub question c.</i>	<i>Lines in Appendix G</i>
“ I remember in C[another school], we took lots of notes. I think that if its based on being able to connect on the internet to be able to get on there should be some type of thing where you can only get on this website because I do find that a lot of kids when teachers are talking are getting onto e-mail and instant messengers or look up a blog or soo....”	Lines 149 – 153
“But you don’t want your e-mail blocked because you might need to	Lines 154 – 155

get on e-mail for an assignment”	
“ It seems like a way of babysitting your students. You should have to be watched all of the time but you should be able to have the freedom to do what you need to do for the project. This would help with self-motivation.”	Lines 162 - 164
“You have students that want to try and you have students that don’t want to try. You have students that can sit there and not listen to anything and still pass the class in fine colors. You just have a wide variety of people. So it wouldn’t be fair to just block everyone. Just because of the five people in your class you can’t trust compared to like everyone else who can self focus.”	Lines 169 – 173
“ This is going to be developed into a program right? How easy would it be to use it. There are classes all over the place trying to teach people how to use Word, Excel and Power Point as it is would it...”	Lines 181 – 183
“But what would happen if the circuit would break or you’d loose it”	Lines 276 – 277
“...but um I think it would be great. Maybe you could have different levels a more advanced option for high school than for children”	Lines 291 – 292
<i>When asked if there was anything else that would help...”Pictures”</i>	Line 321
“Yes or like drag them from the internet”	Line 323
“Pronunciations would be good as well”	Line 326
“Then are you the only one that can access it?”	Line 335
“An audio part would be cool”	Line 352
“The program itself is good other than that it’s things like will it crash and other technical issues”	Lines 362-364

Some students mentioned some of the same requests for aesthetic changes as the teachers. They believed that including a place where pictures could be used for remembering vocabulary is important as well as being able to drag pictures from the internet. Students also came up with other interesting features including the ability to pronounce the words and an audio component of the tool so students could record sounds to help with remembering the term.

Students also came up with the ability to lock down the tool so learners couldn’t get distracted with the other areas of the web like checking e-mail and chat rooms, although this idea was met with some resistance. Other students felt that it was babysitting students and all students should not be punished or treated less responsible because of a few who are less responsible.

Sub question d.

According to teachers and students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?

Table 4.9 Comments from students about Research for sub question d

<i>Comments about Research for sub question d.</i>	<i>Lines in Appendix G</i>
“This is a cool program. Good idea. Good all the way through.”	Line 259
“I think it’s good because then we could let teachers know that we’ve already covered something. We go to Social Studies and you keep hearing the same thing. You take the same notes. Like with this, you take the notes one time, and if they discuss it again you just bring it up and you can just review your notes. I remember back in 8 th grade and they still teach you it like right now.”	Lines 260 – 264
<i>Multiple students...</i> “It looks really good to me”	Line 265
“It would be great to have it for college”	Line 274
“It would be great for high school”	Line 275
“I like the fact that you can just type something in an your information is there”	Line 294
“That’s awesome to be able to type in a word and all of the information just pops up instead of digging through these notebooks and going back and asking when did we learn this...I think in August.”	Lines 295 – 297
“But with this to be able to type one word in and find it and having it all connected together would be great”	Lines 313 - 314
“In future grade levels you would want to be able to look up words also”	Line 355

Overall, students believed this would be a great tool for learning. Some students felt it would be great for high school and college to refer back to. They liked the fact that all of the information just appears with the ability to just type in a word and click search. As students were discussing the possibilities, they also retracted some of their earlier statements about not having the tool available in the younger grades. They felt it could be useful all the way through school when one is taking notes. Overall, students felt they would use this tool for banking their

information and retrieving it to either refresh their memories or be able to add to the Knowledge Banks as new concepts are introduced.

Sub question e.

Would expanding the Knowledge Banks to all areas of instruction be useful in promoting transfer of knowledge across grade levels and content areas?

Table 4.10 Comments from students about Research for sub question e

<i>Comments about Research for sub question e.</i>	<i>Lines in Appendix G</i>
“Yes it would be useful...webbased you’d be able to access it from vacation from where ever you would want to and year round instead of just during the school year...”	Lines 97-100
“I think it would be useful but probably not at the 4 th and 5 th grade level because when I was in 4 th or 5 th grade I didn’t know how to use computers and all of the that yeah but I don’t think that 5 th graders would”	Lines 101 - 103
“ Today in algebra, I couldn’t remember what we did last week”	Line 121
“Well I don’t have a computer at my house either so um we used notes in American history class and it was kind of hard because we had all of these different folders across our screen. It was hard for me to figure out where WWII notes were vs Vietnam. With this where you’re able to search and you can click on something and find it and since we have the internet connected to it that’s awesome because I would go to the library and I might have a jump drive or a disk just type in the item and here is my notes from all of my classes that year. That would be awesome”	Lines 135 – 141
“I think it’s useful because I am not organized at all. I take my notes and I throw them in my locker and I may never see them again. So for organization sake this would be awesome with all of the information in one place. I think it would be mostly helpful in high school and maybe through 8 th grade because like 4 th grade wouldn’t need it. It’s like middle school on up.	Lines 144 - 148
“ Yeah and I think also you learn a lot if the information keeps recurring. If I learn something 4 times. I might not remember the first and second time but the 3 rd and 4 th time I think I might have it and I won’t forget that then. Let’s take vocabulary as an example. I have pretty photographic memory so I can look at my book 3 minutes before the test, go through the test, and get them all right. Then it is gone.	Lines 202 – 206
“I think it’s good because then we could let teachers know that	Lines 260 – 264

we've already covered something. We go to Social Studies and you keep hearing the same thing. You take the same notes. Like with this, you take the notes one time, and if they discuss it again you just bring it up and you can just review your notes. I remember back in 8 th grade and they still teach you it like right now.”	
“I think it would be good if you used this like at 8 th grade on and through high school and then you have it in college it would be really good. You would probably get your own computer there.”	Lines 281 – 283
“I kind of think we're back to point of where we were talking about using this in 4 th grade and on up. Once you think about it if a kid would have a program like this. They could put all of their learning into it. They would be.... It would be better how to teach kids how to do this stuff at a younger age. If they could start at 4 th grade cause I know you have to start some where with typing by yourself I mean this would be so helpful that just to think of how all the kids.....but um I think it would be great. Maybe you could have different levels. A more advanced option for high school than for children.	Lines 284 - 290

Some students could envision the use of the Knowledge Banks tool in courses throughout the grade levels and into college. At first they didn't see how 4th and 5th grade students could use the tool until they began discussing the benefits of the tool. Then some students saw the benefit in documenting the information throughout their school years including 4th and 5th grade. Connecting information between grade levels so teachers don't teach the same things between the grades and teaching new concepts enough times for students to learn was recognized by the students as a benefit to using the Knowledge Banks. They believed it would help in transfer of knowledge between grade levels.

Sub question g.

Would the entire Knowledge Banks tool concept change the way you learn?

Table 4.11 Comments from students about Research for sub question g

<i>Comments about Research for sub question g.</i>	<i>Lines in Appendix G</i>
“I kind of liked as an example in American History we are talking about the Vietnam war and we got into this big discussion about Vietnam and we didn't understand what we were fighting over and then Mr. R connected with the current war we are having in Afganistan. It is a lot easier to learn when you compare it to something that is in our generation.”	Lines 196 – 200

“Yeah and I think also you learn a lot if the information keeps recurring. If I learn something 4 times. I might not remember the first and second time but the 3 rd and 4 th time I think I might have it and I won’t forget that then. Let’s take vocabulary as an example. I have a pretty photographic memory so I can look at my book 3 minutes before the test, go through the test, and get them all right and then it’s just gone.	Lines 202 – 206
“In American History, I like that we take notes on computer. It’s a step up from paper pencil but at the end of the year the whole thing was like filed here and filed there. Mr. R is like..just drag it into your notes folder but then you asked ‘ok where is the notes over this’ and you have to open up all of the notes and think ‘oh this isn’t the right one where is it.’ ”	Lines 300 – 304
“Yes, Yes it would be like very organized and I hate being unorganized.”	Line 351
“Oh yeah, yes.....”	Line 354

Students quoted specific examples of when they have forgotten things they have learned and could have used a tool such as the Knowledge Banks to find the information they needed to enhance their learning. Students also explained that it sometimes takes several times of hearing about things before they remember or understand what is being taught.

Organization of knowledge and information is also important to the students so they can actually find the information. Students were asked if they thought this tool was worth being developed further and in unison student repeated “yes, yes, yeah”. They seemed to be excited about the product and how it could help them learn, access previously learning, and build on what was previously learned.

Recommendations for changes based on the teacher and student peer reviews

The peer reviews supported the need for the tool and the belief that students would use this tool. The features that rose to the top as things that needed to be changed included the ability to include graphics and other non-linguistics elements within the forms. Also making the tool web-based was recommended, as well as having the ability to lock out students from doing other things while on the tool, although this met with some resistance from the students. Security was mentioned in each group as an important aspect of the tool. The students also mentioned including an audio portion to the tool. Teachers thought the ability to adjust the fields adding more flexibility to what students enter into the tool would be an asset. Teachers also thought a place for graphs would be beneficial for subjects like math.

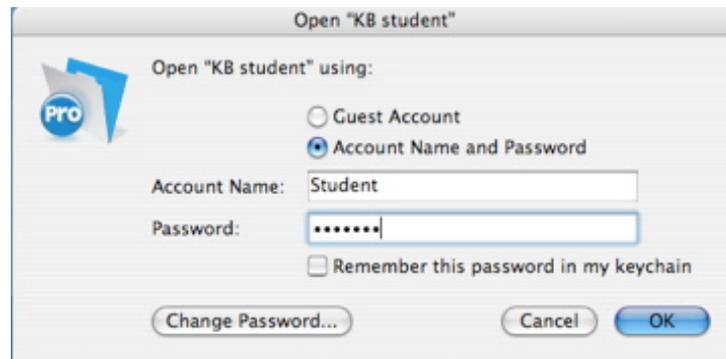
After reviewing the limitations of this study and noting the recommended changes, the following changes occurred to the vocabulary prototype. These changes were completed before the preliminary field test.

- 1) The tool should include security passwords
- 2) The tool should be user friendly and include additional graphic organizers
- 3) The tool should include the ability to use graphics, audio, and external files to describe the vocabulary terms.
- 4) The tool should be web-based

Security Features

The revised Knowledge Banks tool begins with a security feature that will allow students to have access only with the proper account name and password. This is shown in figure 4.8.

Figure 4.8 Security feature



User Friendly and Additional Graphic Organizers

Each record includes the user name, grade level, subject, and unit name. These fields are used as search fields in obtaining information within the tool. The available search fields include grade, curriculum area, and unit name as shown in Figure 4.9. The unit name is newly developed to add an additional field for searching as defined by the teacher or student. With the ability to choose a unit name specifically for which to tie a group of words, the teachers have additional flexibility for a search field.

To add consistency in the unit name pop-up menu, the option to add the unit name to a pop-up menu was used. The unit names will build in a list as new unit names are entered. The pop-up menus are seen in figure 4.10.

Figure 4.9 Initial information collected for searching criteria

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Figure 4.10 Pop-up menus

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

When entering a new record, there are several options of graphic organizers available for students to use. These organizers include the Frayer model (Figure 4.11), concept definition map, and definition word chart (Figure 4.12). These organizers were included in the original prototype. After conversation with the teachers, they mentioned the use of combo notes (Figure 4.13) and a place for general notetaking (Figure 4.14). These additional tools were developed in the revised Knowledge Banks.

Figure 4.11 Frayer Model

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Figure 4.12 Definition Word Chart

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Figure 4.13 Combo Notes

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

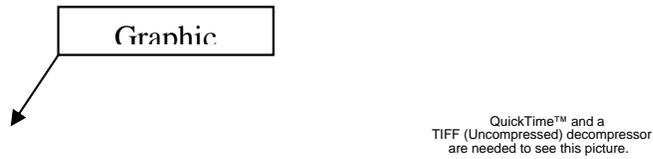
Figure 4.14 Notetaking

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

Using Graphics, Audio, and External Files

Both students and teachers suggest additional ways for students to represent the new words nonlinguistically. Therefore, the revised Knowledge Banks tool also includes a variety of ways to represent the new term. These are displayed in the tabs across the middle of the screen including graphics (Figure 4.15), file (Figure 4.16), audio (Figure 4.17), Wicktionary (Figure 4.18), and Web Page Reference (Figure 4.19). These representations add flexibility and options for students to add meaning to the words. Both teachers and students recognized the need for a variety of ways to display and make connection with the vocabulary word. The development of the tabs attempt to address the needs described by the populations in the reviews of the initial prototype.

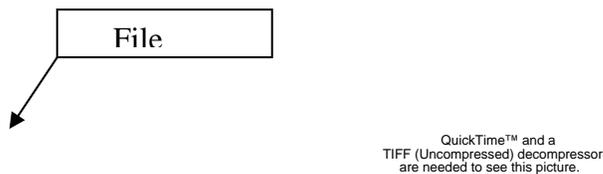
Figure 4.15 Adding an Image from the screen



To add an image students can find the image on the web and drag and drop in into the image field. Students can also click the button to select an image by file.

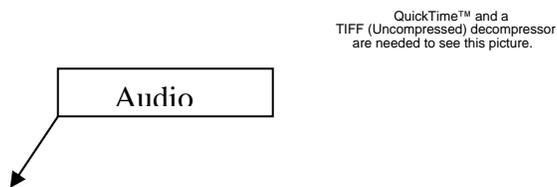
To add an external file (Figure 4.16) to the file tab students can click the insert file link and the option will be available to import a file. This file can be a Word document, a Power Point, a pdf document or anything else. This file will then be within the database and can be downloaded onto the computer when students click on the icon. When the student Knowledge Banks tool is opened up for web access, the attached files can be accessed from any computer. The computer must have the software needed to open the document. For example, if it is a Power Point document the computer must have Power Point software available to open and view the file.

Figure 4.16 Adding an external file



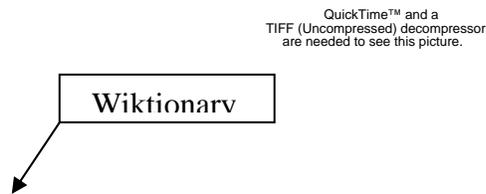
When adding audio to the file, the student must double click on the audio box as seen in Figure 4.17. A recording screen will then appear and student can record whatever they choose. When accessing the audio, the student double clicks the speaker icon. If the audio needs to be deleted, the student can click on the audio icon and hit the delete key.

Figure 4.17 Adding audio



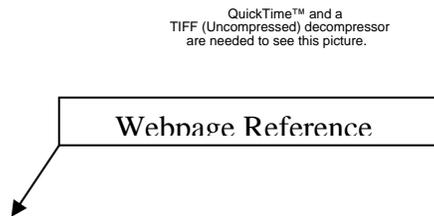
Wiktionary is a site that simulates a dictionary. It includes pronunciation as well as definitions of the term. The Wiktionary tool will automatically bring up the screen that applies to the concept or word entered. The actual website appears in the tabbed section of the tool. An automatic search occurs when the word is typed into the concept field, Wiktionary will look up the definition and place it in the tabbed location. Students can then see this definition and pronunciation of the word as well as other information that would typically be found in a dictionary.

Figure 4.18 Wiktionary



To enter a web page reference, students will either type the link into the box provided or drag the link from their favorite browser. When wanting to retrieve the link, students click on the link provided and the URL will automatically open up into a new web page available for viewing. This provides a place for further reference to the word or linkages to any student developed webpages that connect with the term.

Figure 4.19 Adding a webpage reference



Preliminary Field Test

Procedure Used for Preliminary Field Test

There were seven students involved in the student peer review and these students were invited to participate in the preliminary field test. One of the seven students move to another school leaving six of the original group of students. All of these six students were invited personally to participate in the preliminary field study. The invitation included an initial training for the use of the tool on the morning of October 2nd, 2006. Four students came to the initial training. At this time a computer loaded with the Knowledge Banks tool was provided to them. Their mission was to use the Knowledge Banks for four days in their classes on new vocabulary, terms, and concepts. The four students’ teachers were made aware of this mission so as to have the chance to voice any concerns they might have; there were no concerns noted. On Thursday, October 5th the students met after school and information was collected in a focus group atmosphere about their experiences using the Knowledge Banks. The information was collected via tape recording and the conversations were transcribed. The results follow.

Results

Sub question c.

What aesthetic features would make the tool more useable?

Table 4.12 Preliminary Field Test Results on Aesthetic Features

<i>Comments about Research for sub question c.</i>	<i>Lines in Appendix H</i>
“There is nothing that comes to mind right off the top of my head, but maybe a few technical things. Like, for example, if I were to type a word in and it was misspelled, it would underline in red and I would be able to control.”	Lines 53 - 55
“The only other thing would be uh to be able to transfer vocab words and put them into a different format possibly, although I’m not sure exactly how you could do that, but I mean, uh, for the purpose of this program, you’d have to hold all of this information for an extended period of time and you would want to be able to uh I mean if the computer would crash or computers get old you want to be able to transfer all of the information and be able to condense it all into a smaller format because a computer can only hold so much.”	Lines 58 – 64
“The only thing I had trouble with was um when doing the pictures,	Lines 68 – 70

You had to go out to desktop to do them and it would be nice to be able to go directly to the web to get to them.”	
“The only thing I could think of is if kids could put it on their jump drive and be able to take it home and use it at home too.”	Lines 93 – 94

The changes for further development of the Knowledge Banks include the ability to go directly to the web from the graphic tab. One student felt it was a hassle to go to the desktop to open the internet enabling the student to then find the graphics associated with the new vocabulary words. They felt a link right on the graphic tab that opened a browser would be helpful.

Another student talked about mobility of the information contained in the Knowledge Banks. This student discussed the ability to put the information on a jump drive and take it with her. Making the information available on the internet would help with mobility; however, she also referenced students that do not have a computer and how this information would become available to them.

One student was concerned about storage space and the ability to condense information so hard drive storage would not be an issue while another student wanted the spelling and grammar functions. Overall students were pleased with the tool with a few suggestions for further development.

Sub question d.

According students, would a tool, such as the vocabulary portion of the Knowledge Banks, assist students in maintaining and learning new vocabulary?

Table 4.13 Preliminary Field Test on Usefulness

<i>Comments about Research for sub question d.</i>	<i>Lines in Appendix H</i>
“Pretty useful tool...”	Line 2
“I liked the tool a lot...”	Lines 6
“I thought that it was a really awesome program...”	Lines 12
“I like the fact that I could just pick it up and look through it.”	Lines 16-7
“And a lot of people thought it was really cool. A lot of my peers looked at it and they thought that it was just awesome how they could just type in some stuff and it was right there, you know.”	Line 21 -24
“If there is an American History assignment and we’ve gone over	Line 42 – 43

the Holocaust or something and you already have written all of this information on it, it would be helpful to know that we have already talked about this in classes...”	
“I think that it would definitely improve the way we speak and stuff with the vocab and stuff. Like you just said history, math everything. I thing that the way we speak would be so improved because we would be using those vocab words instead of learning them and then forgetting about them.”	Line 42 – 49
“What I liked about how we search is we could put in a word let’s say Hitler and it would bring up all of the stuff throughout the bank about him.”	Line 104 – 106
“I would definitely get rid of the notebooks, the planners, everything if I could just use this.”	Line 115 – 116
“Well I graduate in 07 you have some time to get this ready for me. I’ll be ready for my copy of it. You can give it to me for a graduation present.”	Line 132 – 133
“I mean the last four days having it has been great.”	Line 138
“Finally someone is thinking about us and how to make things easier and more efficient for us.”	Line 150 – 151
“If I could just click on the Knowledge Banks and I have all of that information there it would be like twenty folders I would have to go through.”	Line 156 - 158

The student Knowledge Banks were viewed for information to add to this study. There were four Knowledge Banks created during the school day by four different students. Table 4.14 provides a breakdown of the types of information collected in the Knowledge Banks as students were using it in their classrooms. All of the nonlinguistic representation tabs were used for some words not all words. Student 1 collected 25 words. Three of these words had graphic attached, one word had a file attached, and 2 words had audio attached. Student 2 recorded 11 words. Four of these words had graphics attached, 0 words had files attached and 1 word had audio attached. Student 3 recorded 12 words. Three of these words had graphics attached, 0 words had files attached, and 5 words had audio attached. Student 4 recorded 30 words. 6 of these words had graphics attached, 1 had a file attached and 4 had audio attached. Most of the students tried the nonlinguistic options of the Knowledge Banks.

There were a variety of nonlinguistic representations found in the student created Knowledge Banks. A graphic was found for the words friction, herb, graph, hemo, diffusion, and others. Audio was used by one student to capture her teacher’s explanation of the term she was entering in the Knowledge Banks.

Table 4.14 Details on Data from Student Preliminary Field Test

	# of words	# of graphics	# of Files	# of audio
Student 1	25	3	1	2
Student 2	11	4	0	1
Student 3	12	3	0	5
Student 4	30	6	1	4

Overall, students felt the tool would be very useful and they felt it would help them to learn vocabulary. Students felt as though they could dispose of the notebooks they currently use and use the Knowledge Banks tool for learning. They liked the searching capabilities and the ability to have their notes pop up at a moment's notice. Students were excited about the idea that there might be something that will help them to learn better and to keep them organized. They felt like with everything condensed in one program it would be easier to get to the information and find the notes they need for new learning. Students liked being able to type in one word and all of the notes that relate to that word were included in the search return.

CHAPTER 5 - Implications and Recommendations

The purpose of this study was to see if a Knowledge Banks tool could be developed that would have the potential to assist students in successfully learning vocabulary. This preliminary tool was developed and then reviewed by both teachers and students. After the review, changes were made to reflect many of the suggestions of the groups taking into consideration the limitations of this study. Students were then involved with a preliminary field test. The implications of this study and the recommendations for future endeavors are discussed in this chapter as they pertain to both learning and instruction.

Learning Implications

The students who participated in the preliminary field test stated that they definitely believe that the Knowledge Banks tool would help them to learn vocabulary better than the traditional methods being used now. This research implies that students not only would appreciate a tool like the Knowledge Banks to replace the common tools used in education today such as the spiral notebook, but they believe that they would also learn better with a tool such as the KB. Students claimed they would give up their traditional tools to use this tool that captures all of their notes and understandings in a searchable format for later retrieval. The teachers believed that this tool would allow students to activate prior knowledge so they can build new knowledge around what is already known. They believed this tool would help them gain a deeper knowledge base of factual information, because this information will be organized in context and students will be able to retrieve the information easily. They believed that by reviewing the information in their Knowledge Banks they could regenerate past learning and build new understandings.

The Knowledge Banks tool has the power to give students the tool needed for maximum learning and organization of information as perceived by some teachers and students.

There are five characteristics identified by the researcher that The Knowledge Banks tool would display: *document understanding, activate prior knowledge, stimulate metacognition, categorized information* and *promotes transfer of knowledge*. The literature review identified

tools already developed that contain some of these characteristics. Does the final developed prototype and the research from this study support the identified characteristics?

Document Understanding: The first characteristic is to document understanding. There are a variety of ways to document understandings and students believed that the tool allows them to call up the terms, relearn them, and build on them. The Knowledge Banks tool allows students to document their understandings of a particular term as well as have the ability to recall the term at a later date reactivating their prior knowledge. There are a variety of ways the students could document their new learning including the Frayer model, definition word chart, concept map, combo notes, and notetaking.

E-Portfolios also provides a method for documenting learning, however they only contain the best work and not all of the students' work. TaskStream also enables students to document their learning but in a limited manner as well with only the best work and not all work. It stores the information to be viewed at a later time, but does not promote changing the information as additional learning occurs.

The feedback from the students and teachers suggests that both groups thought that the Knowledge Banks would provide a means to document understandings.

Activates Prior Knowledge: Students were very excited about the ability to look up past learning. By searching out information over time students have the opportunity to recall information. The graphic organizers used for activating prior knowledge are built into the Knowledge Banks tool as well as a searching mechanism to find the past learning.

Inspiration is a tool that allows for a variety of organizers depending on whatever the student would need. The Knowledge Banks tool has five set ways to document understandings so in this respect *Inspiration* is much more flexible. However, with *Inspiration*, students create a file, save it, and create additional files and save them. These files are not linked in any manner to search out and find information that is related. The Cmap Tool is very similar to *Inspiration* with added functionality to share webs around the world. Again, the ability to connect related information is not available, although, these are great tools for activating prior knowledge that is stored in memory.

According to the comments made by the students and teachers, both groups perceived that the Knowledge Banks tool would assist in activating prior knowledge.

Stimulates Metacognition: There are many tools that enable students to stimulate metacognition. The tools mentioned above are some of them. The Knowledge Banks tool also stimulates thinking and learning by allowing students to rethink learned terms, change the understanding of these terms, and develop new understandings. The students involved in the preliminary field test agreed that the use of the Knowledge Banks allowed them to rethink learning in the past and stimulate metacognition by having the ability to recall what was learned in the past, reprocess it and add new understandings to it.

Productivity tools like Microsoft Office also promote metacognition. Hyperstudio is also another tool that helps student think about their learning and move into higher order thinking skills. The Knowledge Banks tool has some of these characteristics, but students can also create any document using any of the tools and attach it to a concept within the Knowledge Banks. In this way, disconnected files become connected concepts of new learning.

Because students are able to recall previously learned information, students and teachers believed that students would be able to gain a deeper understanding of the term by stimulating metacognition.

Categorize Information: The Knowledge Banks tool has a variety of ways that information can be categorized including by: concept, subject, school year, topic, date, or a variety of all of these. Students can seek out information by doing a simple search and all of the related information appears before them. Students reported this as one of the most exciting parts of the Knowledge Banks. Students obtain many notebooks of information. This gives them an appreciation of the ability to type in a word and get all of their information about one term instantly. This ability is perceived a valuable by the students.

Students perceived the ability to categorize and organize the information in the knowledge bank as valuable.

Promote Transfer of Knowledge: Students believed the Knowledge Banks tool would allow them to build knowledge over time and recall this knowledge over time promoting transfer of knowledge to the future. The KB includes: The Frayer Model, concept map, word definition chart, and combo notes which are graphic organizers used to help students make connections to prior knowledge. Typically these tools are paper pencil but the Knowledge Banks tool takes them into the electronic age and stores them for the future. Students appreciate being able to get to this information quickly.

When students and teachers were asked if they believed the Knowledge Banks would promote transfer between grade levels and content areas they believed that it would.

Implications from this research could include changing the way we do school. Students could build their vocabulary within the Knowledge Banks over their educational career rather than build vocabulary for one test and forgetting it after the test is complete.

Implications for Instruction

With the use of the Knowledge Banks, instruction would change from a traditional educational setting where teachers assume students have no knowledge on a particular subject or where teachers have no means by which to remind students of what they have learned in the past about a particular subject. Teachers would have the ability to ask students to find what they learned in the past about a particular vocabulary word or subject and then teachers can ask students to refresh their memory of the past to help build new knowledge of the future.

The introduction of the Knowledge Banks tool would require professional development for teachers regarding the best ways to use the tool and possible issues with the use of the tool, e.g. how to handle transfer students that have no Knowledge Banks, questions of whether to allow internet/email access during class, and/or security issues. Teachers who participated in the peer review displayed concern about the best ways to use the tool with students and they would have to do some adjusting of instruction for student development of their Knowledge Banks.

Overall implications from this research could include the thought that schools are not providing students with the tools necessary for continued learning and building of knowledge. Schools provide instructional resources for students to view and teachers to help make sense of the knowledge presented, but most don't provide a means for students to gather and maintain the new knowledge. Schools depend on parents to provide materials such as pencils and paper to be used for recording new knowledge and documenting understandings. However, these materials are not searchable and it can be quite impossible to generate relationships between concepts or even find the information needed. As one student stated in this research "Finally someone is thinking about us and how to make things easier and more efficient for us." Students are ready to find other ways to document and organize their new learning. In this world of technology, why isn't this available for students – they would appreciate it.

Recommendations

The recommendations for further development include making the tool completely web-based, incorporating additional research based strategies within the tool, and including additional tools for documenting understanding.

Both the teachers and students felt as if portability of information would be of added benefit to the tool. Having the information on the Knowledge Banks tool available at different locations would make the tool even more valuable. One student expressed concern about some students who don't have a computer available to them. Ideally the tool would work better if all students had access to computers at all times; however, having the information available via the internet would allow students to go to their local libraries or school libraries or classrooms to access their data.

Continual research must be completed to assure that the most effective graphic organizers are used in the Knowledge Banks. This prototype originally included the Frayer model, concept map and definition word map. The teachers suggested that combo notes be included as well as just a simple notetaking area. Combo notes is a notetaking tool that was used with the teachers during their extensive training over vocabulary instruction by McRel. Knowing what tools work the best for continued learning is important for maximum student learning. These tools should then be included in the revised version of the Knowledge Banks, and teachers not familiar with these strategies would need to have some experience with them in their professional development associated with the use of the Knowledge Banks.

Both the teachers and the students felt that other typing tools would make the prototype more usable including a way to graph numbers or display special mathematical and scientific characters. To take notes over certain mathematical concepts, students must have access to square roots and other mathematical terms. If a tool palette could be available for these types of number representations, then the use of the Knowledge Banks tool in math and science courses would be easier. Students also mentioned the ability to include different languages. Many languages have accents or different alphabetic letters that are required when taking notes or documenting new learning. A palette with these different languages would assist in documenting knowledge about the new languages as well as assist English language learners in documenting their understandings.

Next Steps in Development

- 1) The vocabulary portion of the Knowledge Banks tool should be developed so it is completely web based including the ability to add graphics, files, audio, and web links from a web browser using specialized scripts developed by third parties. At this point adding graphics, files, audio and web links are only possible in the program Filemaker and not from the web page without additional programming.
- 2) A server would need to be purchased to store the Knowledge Banks as well as server software to service the tool. All students could be contained in one database. This would call for a mechanism to seek and search out all of the records that are attached to one user. If the tool is web based then by using the log in as a search field, student records could be found so students could add additional information or they could create new.
- 3) The log in feature would need to be developed further for smoother operation, allowing students to choose a log in and it be attached to each record developed and the also used in the find command.
- 4) The additional tool palettes including mathematical functions and symbols to assist in documenting new learning would need to be developed and made available to be used with the tool.
- 5) Adding a drawing and graphing function to the tool so students can use the mouse to draw different graphics would need to be developed.
- 6) Adding the ability to type in different languages would need to be developed.
- 7) A field test will need to be completed including a variety of schools, computers, students, classrooms, and teachers.
- 8) Changes identified from the field test will need to be included in the final production of the tool.
- 9) The tool will need to be marketed.

Implications for the Research Site

Students believed that the researcher should try to get the product to the point that they could use it at the research site. There is a cost associated with getting this product ready for 800 students so it would be up to the superintendent and the board to determine if they will be able to put the Knowledge Banks tool into action. As the Knowledge Banks tool stands right now, the cost would include Filemaker licenses for the 800 students involved. The program is not entirely web-based so students would need Filemaker on each computer for the program to run. The data could all be stored in one place or on one server but the local computers would need a copy of the program to run the Knowledge Banks.

There would also have to be computer access for all of the students preferable a computer for each student. There are many computers available at the research site but not one per student and if all students were to be taking notes and documenting knowledge they would need access.

Future Research

Future research would include a complete field study including a larger representation of students and teachers. This study would need to be completed over a period of time so concrete data could be collected about the actual impact the Knowledge Banks has on learning vocabulary. Data would also need to be collected on the use of the Knowledge Banks by teachers and the instructional adjustments that would need to be made for effective use of the Knowledge Banks. As the tool is developed further, research would need to be completed to continue to determine the use across all discipline areas – whether it stimulates transfer, enhances understanding, and in fact is usable over the many years of schooling.

Research will also need to be completed on the options available for storage of data when students have completed the K-12 environment. Would there be an option of putting all of the information on a CD? What is the best manner to allow student access to their Knowledge Banks for use over a lifetime? These would be topics of future research.

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Appendix A - Teacher Permission Form

Dear TEACHER:

I am a doctoral student at Kansas State University. One of the primary goals is to find ways to help students learn utilizing technology. You will be shown a prototype of a tool on a computer that can be used in vocabulary instruction. In a focus group setting of 4 TEACHERS you will be asked for your feedback on its value and its possible effectiveness in their education. This focus group discussion will be recorded so the researcher can review the comments for completeness. The discussion will last between one and two hours and the survey is expected to take about 15 minutes. The primary focus is on improving instruction for students. **You may choose to not participate in the research at any time.**

There are no foreseeable risks involved in the study. No names will appear on any of the documents used in the final writing of the study. All materials will be kept confidential within the discussions in the focus group. The benefits of the study to the participant include research about learning strategies that could be used in the future of education. The form below will be used to document your permission for this activity

Sincerely,

Denise Guy
Director of Student Learning
Xx Public Schools

Researcher Contact Info: Denise Guy, 422 N Mulberry, Xx , KS 67410 Phone: (785)-263-2630
IRB Chairman's Contact Info: Dr. Rick Scheidt, 203 Fairchild, KSU, Manhattan, KS 66506
Phone: (785)-532-3224.

PERMISSION SLIP

TEACHER Name: _____

- I have read and understand your letter regarding your participation in the KSU Study and agree to the following:
- I DO give permission to you to use my feedback regarding a prototype of an educational tool.
- I DO NOT give permission to you to use my feedback regarding a prototype of an educational tool.

Signature: _____ Date: _____

Appendix B - Research Questions for Teachers

Research Questions for Teachers for focus groups. *Other questions may be asked as discussion develops.*

- 1) What are the graphic organizer tools you use for vocabulary instruction?
- 2) When giving students a vocabulary term, how often do they review this term after instruction was given?
- 3) Do students have an organized way of using their new vocabulary from one school year to the next?
- 4) In your professional opinion, would students benefit from this?

Review the tool on a projector, indicating the features of the tool

- 1) What are your initial thoughts on the usefulness of this tool?
- 2) Would you use this tool in your classroom for vocabulary instruction?
- 3) Would you allow students to use this tool in your classroom to look up previous vocabulary and review prior knowledge about the terms?
- 4) What other options would make this tool more valuable?
- 5) What types of aesthetic items would make the tool more functional?
- 6) Do you believe a tool like this would assist students in learning and maintaining new vocabulary?

Review the Power Point regarding the concept of the entire Knowledge Banks

- 1) Would this be useful with students if they all had their own computers and were able to use it across grade levels from 4th grade through 12th grade?
- 2) Would this change the way you presented new material or taught new material?
- 3) In your professional opinion, would this help with transferring knowledge between grade levels or curriculum areas?

- 4) What do you see as the down falls to using a tool like this?
- 5) Do you believe a Knowledge Banks tool would be useful in a students overall education?

Appendix C - Teacher Focus Group Transcription

1 As you know I've been working on my dissertation for about 400000 years. The thing
2 that I wanted to focus on is a tool called the Knowledge Banks. Heavily into technology.
3 The ideal situation is if each student had a computer of their own or at least had web
4 access. Keep in the back of you're minf MyLearningPlan where you have access to go
5 in and procure information and add your files and it stores on the server and you can get
6 to it anytime on your computer through a password. This could be one angle if kids
7 didn't have their own computers. The way I'm going to do this today is I'm going to
8 give you the vision of the overall Knowledge Banks and I didn't develop the overall tool
9 because that would be very expensive as well as I don't have the skills or the man hours
10 or the money to develop it the way I'd like to. What I did was develop a prototype of
11 just the vocabulary part that I would envision to be used in a classroom so I'll give
12 you the broad picture and then we are going to narrow it down to just the vocabulary 13
portion of what it might look like in your school. Ok. The vocabulary part with some
14 tweeking, you know anytime you develop anything for production you would have to
15 do a lot of testing and what not. It's not to the point where it could be used by
16 students but it could get that way eventually and be thrown up on the web and used
17 some day down the road. So anyway this is a prototype and this is a big vision and
18 you'll see the prototype and then I have some questions that I'll ask you. I'll just go
19 around the room and I'll have you answer those and then if you want to engage in
20 discussion between each other that is fine too. What I'm collecting is your discussion
21 and then your survey and whether or not you could use this tool or not in your
22 classroom.

23 The reason I choose you guys is because you are all I respect your teaching and your 24
knowledge in your content area a lot and I felt like you would give me your honest
25 opinions and uhm some good feedback so I can either make this tool better or ditch it.
26 One or the other. So here we go. Here is my research question and those of you who
27 were in Teachers as Researchers know that you come up with a question first, brings

28 back great memories doesn't it. "Can a Knowledge Banks tool be developed that has
29 the potential to assist students in successful vocabulary development?" Again just to
30 emphasize I have developed a prototype for my proposal and not a finished tool. Ok
31 these are kind of the three key findings that this was based on and this is not only the
32 vocabulary tool but the entire project itself the whole Knowledge Banks. Uh *How*
33 *People Learn* is a book that was developed by a lot of the research out there the brain
34 research, educational research, cognitive psychology research and it just kind of
35 pulled it all together and they came up with these three key findings. The first one is
36 that students' initial understanding must be engaged or students may fail to understand
37 new concepts and that deals with the background knowledge. Number two students
38 must have a deep factual knowledge, understand these facts in the context of a
39 conceptual framework, know where it fits in the context and be able to organize the
40 knowledge the knowledge in ways that facilitate retrieval and understanding and then
41 the third one is a metacognitive approach to instruction can help students take control
42 of their own learning. So those are the three key findings of *How People Learn*. That's
43 kind of what this whole concept was based on although when I did my literature
44 review I looked at a lot more than just this and it fit really well so.

45 Ok so education today at the beginning of school students come to school with
46 clean notebooks, check out a textbook, students take notes to document
47 understandings, they make connections with the text, use graphic organizers to make
48 additional connections to their prior knowledge, students end up with a bank of
49 knowledge on paper and pencil and we start that around 4th grade where students are
50 reading to learn instead of learning to read. So if we have 4th through 12th grade and
51 have our 4 core areas that would be 36 notebooks of information with one notebook a
52 year of information that they have obtained in their high school, middle school, and
53 elementary career. So at the end of the year students give back their text and a lot of
54 times out the door they'll throw their notebooks away and just dismiss everything
55 they've done all year. Some kids don't. I know some kids who have stored their
56 notebooks away and do refer to them from time to time. With the advances in
57 technology today I feel like we can do better than this for our students and that's
58 where the whole idea came from. So what I'd like to do now is just kind of show you

59 my vision.

60 There is a website called...um...oh...what's it called...I can't remember now. It's
61 similar to this but basically you have two screens you have your schema on one side
62 and you could call it something different and your workspace on the other side. They
63 didn't use it in the context of education at all but used in the context of drafting and
64 whatnot but when I saw it I thought Wow this could be wrapped into education and if I
65 was to develop this further I'd probably go to that company and talk to them about this
66 but that is down the road. So a little bit about how this might work...let's say at the
67 beginning of your class you come in a say "alright we are going to take a few notes
68 and then we are going to get on with our hands on or whatever it might be and let's
69 say Kori is at social studies so we'll click social studies and it brings up all of the
70 different areas of social studies. So this the schema or the whole context of what she
71 is learning so everytime she would come through this she would kind of see where it 72 fits in
the whole picture of things and then she would click on world history let's say
73 she's in world history and right now today were studying world wars and we're going
74 to study...and I played around a little bit with color scheme..I thought if you do this
75 over the years you could pick blue for your freshman year yellow for your sophomore
76 year and you could start seeing how it all pieces together. So let's say she is studying 77
world war I and you click on World War I and the question is What are the causes and
78 consequences. So over here on the side then either by teacher direction or after a
79 while the kids get to feeling with the different tools...these are just a smidgin of what
80 I thought of I mean there are many other ...there is combo notes and what else...there
81 are other different things you can use...teacher lead notes, notes that are somewhat
82 developed by the teacher. Let's say she picks Cornelle Notes. Then it would come up
83 and over on the side then she would be able to document the causes and consequences
84 of World War I and it would all be housed in a data base or Knowledge Banks that she
85 could...if you look at the top it's kind of hard to see...could search, she could pick the
86 particular vocabulary from that area, she could do some other things that would help
87 her have access to that knowledge after she learned it initially. OK. So this is kind of
88 whole big picture but that is just a Power Point slide. I just happened to click in the
89 right areas so it really has no meaning...I mean I couldn't go back and show you other

90 areas. It's just to kind of show you the vision.

91 Now why did I focus on vocabulary? Simply because looking at the research on
92 students in high socioeconomic vocabulary is one of the strategies to help bring those
93 students up to where other students might be. So that's why I focused on vocabulary. 94 It
can have a high impact on student achievement, most teachers already focus on
95 vocabulary and to some extent it's not necessarily something new. OK. So That is it
96 for that portion of it, now the actually vocabulary tool...I used Filemaker. And the
97 Filemaker is a program that you can make things web ready so it could sit on a server
98 and could be password protected so students could log into a server somewhat like
99 Moodle with a password and and username and um access just their information so
100 that is one reason why I choose Filemaker but I have not put this on the web because
101 I don't have a server to set this on and that takes dollars I don't have as I wrote in my
102 proposal. I don't have a lot of extra of that so we will go with this for now and you
103 can see what kind of tool it is. Look for things that you think would make this a
104 stronger tool and other things that I could put in her that might make it more user
105 friendly or if you don't think it would be of use at all I need to know that as well. So.
106 This would be the front end of it. The first thing that would come up would be their
107 name and after the initial login that would automatically pop-up at all time. So then
108 your current grade level whatever it might be and then whatever subject you're in that
109 you are looking at vocabulary at that time. If you click on this you can pick the
110 different subject areas that in might...you might be in to collect your vocabulary and
111 then also up here you can pick the different grade levels. Ok. Now if we were to
112 begin entering a tool could be either teacher directed or if um...you know... as
113 students feel comfortable as they take ownership in their own learning there may be a
114 favorite that they might want to use as they learn their new vocabulary. Um but if
115 we click on concept map, it would automatically bring up this map. And I happen to
116 have a vocabulary book....

117 chuckle chuckle...absolutely.....English Teacher

118 that you know we could type this information in and it could be a variety of ways.

119 You could just give kids words and have them go out and look for definition on their
120 own. You could..you know... you could give special instructions on however this
121 might be used. What are some examples....

122 pause as entering info into the tool....

123 What is like.... Um...I don't know what else I want to put in here but we'll go on.
124 You could continue on with new word after new word after new word. So that as the
125 kids have a list of words they are studying or a particular unit and you have several
126 words that you are looking at or you can go back to the main menu and you can
127 search by a particular date and print out the information...so.. today's date is the 13th.
128 I'm going to put in the 11th because I know there is more in there so you can kind of
129 see how this will work and it can sort it alphabetically or how ever you might want to
130 sort it the options are there and pick out whichever way you want to print the
131 information. I know X you grade everything online and that could be an option here
132 but some of you still like paper pencil I know I still like things in paper because
133 that's the way I was raised. So you could click it like that and have it come out on
134 paper and students can print it and turn it in...ok... but the real power I see in this
135 tool is not necessarily the printing of it but the searching capabilities. Ok so
136 for instance it this child has kept this up for..since 4th grade...and they go in and search
137 a term they can access the information that they learned back in their prior years. It
138 may change, they may want to relook at the definitions they came up with at 4th grade
139 that may be in simplistic terms. It may not change. But for instance if I search by
140 term I can go in here and I can type in government and it would bring up everything
141 pertains to government that I've put into the Knowledge Banks. If I see something that
142 I am interested in looking at I can click on more info and it brings up the rest of the
143 information in that particular area. If I needed to readjust it at this point I could go in
144 and change things if I change my understanding of what the judicial branch is
145 because many times after we've looked at it a couple of times we have a different
146 view of what that exactly is and you can document that here. You can see that we 147
learned that during Social Studies in our 11th grade year. Ok. We go back to the

148 search here and click on Legislative branch there is another...go through
149 and look at that. Fill in some more facts that we've learned about it. Um they'll get
150 this in American history their 11th grade year and when they get to government their
151 senior year you can bet they are going to talk about it again then this would be a tool
152 that would allow them to access the information that they got from Mr. Y's class in
153 Mr. X class and just "Oh Yea I remember we talked about that". Um, they can go
154 through and search by content area so they can pick which ever particular area they
155 have put information in and those words would come up. Uh, they can search by
156 grade level or by grade level and content area. If they wanted to get all of the 11th
157 grade SS terms and sort them alphabetically and there they are. So that is basically
158 the tool in a nut shell. It is a prototype but that is one of the reasons why you are
159 here is to help me to make it better they also to determine if it is viable or not. So I
160 have a list of questions that were developed in advance

161 So it can take any of this information and print it out in any form you wanted to(M)?

162 Any one of those three vocabulary tool forms

163 But you would have to enter the information...(M)

164 No you could enter it in as a concept map and can print it in the Frayer Model

165 Can you do that (S)

166 Sure

167 Cool(S)

168 If I go back to the main menu and search a word...maybe...then click on Frayer
169 Model...It would print out all of the words that I searched out. Now some of the
170 categories are different in the different models

171 Right That's what I was thinking(A)

172 There will be blanks in some of those areas which might allow kids to build on

173 Uh Hum(B)

174 If one year they talk more about examples of it and the following year they might 175 talk about non examples or more about characteristics or what not . You could add 176 that to your model and could keep it and learn from it.

177 So is that a working document on the bottom. Could you click on those boxes down 178 below and enter in them(S)

179 No not in print mode

180 Ok (S)

181 But if I click cancel, I can go in and change but when it's in print mode you have to 182 print it

183 Does filemaker Pro offer any drawing tools (M)

184 It does not and that would be...I mean that is something I had thought of too where 185 there is a lot of symbols and whatnot in math

186 When we use Frayer Model in our examples and non-examples we do that a lot by 187 picture we draw a picture of an example and a picture of a non-example and it 188 focuses on the vocabulary.(M)

189 And that might be You know...if this was to be developed further there are other
190 tools out there that might be something we'd want to look at

191 I don't know a database store you can't draw in these two boxes down here(M)

192 You'd have to search out a word not a picture.

193 Yes there is no way to draw in Filemaker and being a math teacher I wondered about this

194 I would think in science too there would be...(M)

195 I might draw DNA(S)

196 Ok good

197 The paras that work with my LD students they do all of their vocabulary by

198 nonlinguistic presentations(E)

199 They use pictures. Ok

200 Ok so that is something that I will note

201 Especially when you are talking about what is an example and what is a non

202 example. There is always going to be a textbook definition and some characteristics

203 that you can verbally put but students learn well from the non linguistic pictures. It

204 keeps it fresh. (M)

205 Well especially with the more abstract concepts, you know like photosynthesis, they

206 can't picture that and so it helps if they can see it and draw it.(Sc)

207 What graphic organizers do you use in your classes? You saw the concept map there,

208 Frayer model, and I had the definition word map. Are there other ones that you use

209 consistently for vocabulary?

210 Nonlinguistic(S) but we've already talked about that.

211 Inspiration type...I don't know what the appropriate term is for it but...categorizing

212 something by the things that fall under it. Flowchart like thing. (M)

213 So a category

214 Well I was just thinking of like when we talk about polygon I'll break it down into

215 different parts then even more specifically then you can define a lot of things(M)

216 That was one thing in the Background Knowledge, Marzano has a whole bunch of

217 different categories that about every word fits in and I wondered about incorporating

218 that into this. So I'm glad you brought that up.

219 I don't know if this would fit in to anything like this but I do a lot of analogies.

220 Helps them grasp things onto something concrete that they know and they can make

221 a relationship to something they know. Like relate photosynthesis to something they

222 know. (Sc)

223 Ok good

224 I always wondered if there could be something that a person could substitute on the

225 one with examples on the bottom and then what it is like. My kids have a terrible

226 time with determining the difference because they think they need to differentiate 227

between the two and they'll get the three fine one side or the other but then they can't

228 come off of that and I've been thinking about trying to figure out some way to put

229 something else and what I've been doing putting the nonlinguistic thing in which

230 they draw pictures(E) [one category on the Frayer Model is "what is it like" this teacher was

wanting to substitute something different for this box, like drawing a picture]

231 So instead of having both examples and what it is like, have one or the other then
232 have something else

233 My kids just have a terrible time with it(E)

234 Well you saw me I had a terrible time getting it all in as well

235 I adapt on my Frayer Models, I don't use all the same categories. I change names
236 and heading and figure whatever works for. If they did it over snakes what's an
237 example and non example. They could put anything (Sc)

238 In my field, I really like this because in Geometry specifically in order to understand 239
what an object is a lot of the times you have to determine what it isn't. And so I love
240 that. (M)

241 Yeah I don't have any trouble with that one (E)

242 I was also going to say that I have them add if it isn't on there to use it in a sentence. (E)

243 I noticed in you book they put it in sentence form so on the definition tool there is a 244
place for a sentence. Ok Good

245 I like webbing too. Kind of like what I was talking about earlier, Inspiration.(M)

246 The Kids that know inspiration use that quite a bit for outlining(E)

247 After a new term is taught, how often is that term reviewed on down the road?

248 And how often is that student able to get back to that term?

249 Informally you use it throughout your classes may not be something you say is
250 vocabulary but you interject it in your talks, your lectures(S)

251 In my content area it seems like we give them 10 or 12 new words on the first day of
252 a unit then those things just back and back everyday. It's really upfront a lot of the
253 vocabulary in each unit.(M)

254 How about like the following year do you ever refer to things that were taught in the
255 following year?

256 I do just because it builds upon... I mean I have probably if they take Biology as a
257 sophomore and you might not take advance biology until their senior year but I try to
258 refresh words before so they have a basic understanding of some of the stuff we talk
259 about in Biology or movin on to do a little refresher. (Sc)

260 What if you weren't the teacher in both classes? Would that be a little bit more
261 difficult to do?

262 Probably because I wouldn't know necessarily what that other teacher
263 emphasized.(Sc)

264 We're doing better at that in the math department but I mean that's really hard
265 because when you have the possibilities of 3-4 different Algebra I teachers it's really
266 kind of hard to figure out what was done and to what extent and the other thing is
267 things that pop up and they don't really get more than a week or two to absorb it by
268 the time they get to me they don't remember they did it ever. They might say we'll
269 I've never seen that (M)

270 So would something like this help refresh their memories?

271 I think it would if they had a bank then you could say well type in and see (M)

272 I could see were for Literary terms that could be useful for our area because those are

273 the things from freshman, sophomore, junior, senior. Those definitions don't change
274 and they could go back and while the freshman don't get as advanced as the junior
275 they still use the same ones they could go back and....(E)

276 It's also pretty easy to say I don't remember ever seeing that (M)

277 Yeah(E)

278 Well if they wanted to let's say they could go zoology and they had a whole bank
279 of zoology terms in there and they might never use Niderian again they could always
280 go in a delete a bunch of the terms. Ideally they might keep it because if they take
281 science in college or something but if not they wouldn't necessarily need all of that (Sc)

282 The way this tool is made they don't actually see all of the terms unless they do a
283 search for them. They may never come up again.

284 What are your intitial thoughts on the use of this tool?

285 I like it the only thing is for me I'm such a modifier like when we do Frayer models
286 my boxes are different you know they are different from Biology vs Zoology. I use
287 the definition word chart but mines a little different. It would be..I know a form
288 thing..would be nice for consistency but it would be nice to be able to go in as the
289 teacher and change the different little headings...(Sc)

290 Or add your own fields

291 Yeah and the tool like the drawing capabilities(Sc)

292 Be able to modify the templates a little bit(M)

293 Right. Have a zoology template and they could click on that or something (Sc)

294 I think for the students that want to be students I think this would be great because
295 they will keep track of everything and they would use it and ah I think to a large
296 extent with the 36 notebooks that you were talking about earlier. They are going to
297 be great students throughout the course of the year but the first thing that ask me at
298 the end of the semester is do I have to keep all of this stuff for next semester.(M)

299 And what do you tell them

300 Yes well the vocabulary.(M)

301 Do they ask you at the end of the year if they need to keep it?

302 They're not going to ask me that they just probably trash it. I mean sometimes they
303 ask me things like will we need...would I need any of this information next year and
304 I always tell them yes keep it if you can. I don't know if they ever do(M)

305 Is this webbased or is this software (S)

306 It could be

307 Accessibility would be a concern(S)

308 If they had their own machine it wouldn't matter if it was web based or not(M)

309 Yes mutters in the background

310 Uh (M)

311 And in fact if they had their own machine it could attach to the Word files,
312 Power Points could be attached to the concept being taught.

313 That would be neat (Sc)

314 I would think you would have to have, like you said earlier, you don't have the time,
315 money, or, but I'd think you'd have to have some types of drawing, sketching,
316 something they could draw. I think what Microsoft Word has on it would be enough
317 in many cases. Just tools so they could draw, a pencil tool, ellipses, and some of
318 those tools(M)

319 Or the ability to grab a picture off of the internet and put it on there(Sc)

320 And I would think you would want some type of a graphing capability. It seems to
321 me that Firefox is some of the things that they do, not Firefox, whoever makes
322 Firefox.(M)

323 Mozilla(S)

324 They got that type of capabilities now I think with their softwares.(M)

325 There are some of those out there but I thought a lot about this and decided I wanted
326 to see if this was a feasible project by building a protocol in a program I knew
327 something about and not have to learn a whole new language to find out this really
328 wouldn't help.

329 You'd have to hire a programmer to construct that probably a team of people to
330 construct that or something like that(M)

331 Now I want you to think to the big picture think outside the vocabulary tool to the
332 whole Knowledge Banks. What are your thoughts on that?

333 Unbelievable tool, it would take some trial and error to find the most effective way to

334 use it. I like the idea of a color scheme too. You can make the visual connections(S)

335 I like the potential of the students to be able to make connections from one year to
336 the next. I know that's an issue in social studies but it is also an issue in math. They 337
don't connect algebra and geometry very well unless we paint them a picture and if
338 they'd have the capabilities to cross them over that would be great(M)

339 And even between buildings, you know, I mean I don't know down to the day what
340 the middle school science teachers but I do know concepts they cover then when they
341 have me they claim we've never done that and I know that's not true at least it's been
342 introduced to them. I'm going a little deeper obviously but you know to be able to
343 say hey yeah you have call it up (Sc)

344 Research papers items when students claim they've never done it when you know 345 that
Mrs. P makes them do it you'd be able to have them find it(S)

346 Yes, I think for integration purposes it could be nice because we could click into the
347 social studies and this is what you've talked about and how this novel fits. That
348 would be a great integration tool.(E)

349 We are talking about the Red Scare on Monday and it could be connected in to the 350
Crucible that is done in your class(S)

351 How would it change your instruction in the class or would it if you used it?

352 I think what B says that it would take a little trial and error and you'd have to see
353 exactly how it would fit it and where you would use it. I can't really say right off the
354 bat this is where it would plug in. I would and it would be nice just to be able to at
355 first tell the student, like A said earlier, hey key it in. Look it up on your word
356 definition bank (Sc)

357 Let's see what kind of background knowledge you have coming into it, I mean, you
358 could even in some of these situations, teachers might be able to let the students do
359 the entire lesson if you. If you tap into the background knowledge and say what have
360 you done with this and where have you done this and what did you learn at that time,
361 I mean, when you get through all of that you might have your lesson almost out
362 there. I mean there is going to be some new stuff but (M)

363 It might be the best way to help kids make connections we haven't found a way
364 yet(E)

365 First semester when I did Vocab, I worked pretty hard at doing that but it wasn't
366 seamless. It always felt like it was forced and out of context so I've done nothing
367 with Vocab second semester just because it frustrated me so much that it was just
368 never seamless. So if someone could create that magic, seamless way of integrating
369 it. A is right they know a lot more than they think. They'll say Mrs. X never talked
370 about that when I know she talked about it. It's just getting them to recognize it and
371 those concepts again. Doing that in the framework of your lesson plans would be
372 huge (S)

373 I could see, I could see all of my students sitting there with a computer and not a
374 paper and pencil and taking their notes on their computer and then three or four
375 weeks from then being able to tap into those notes again. And when I say this is a
376 concept that we learned 2 months ago they start shuffling their papers and some of
377 them are able to find it and since we date them when one finds it then I can say go to
378 that date and they'll all find it but with this in 30 seconds they've got it. (M)

379 Yeah, all of our notes are on the computer, they keep them in a folder and ah it's a
380 pain going back to those. They all save it under a different name and but if you
381 could instantly click in to this database and have that stuff be there, that would be
382 nice. (S)

383 So you feel this would help you remember information between grade levels or
384 curriculum areas? You've already answered that.

385 What do you see as the downfalls of the tool?

386 Every student needs a laptop. When you've only got like me 12 in a room and you
387 have 24 kids in class they have to be partners or have 12 kids do this while 12 other
388 kids are doing something else. It can be done it's just...I think ideally it would be
389 nice if a kid could sit down and type in their notes. They want this now so they look
390 it up they refer back to for each individual student (Sc)

400 It would be strongly recommended that to use a tool like this each student would
401 have a computer.

402 We have just enough to be teased. I'm in a spoiled situation where we are one to one
403 but everybody else has just got 12 and that really is not an ideal situation. You're
404 always having to partner up then one kid is on the keyboard and the other kid is just 405
basically sits there and is not engaged. (S)

406 I think to with some of the things that we've been talking about for some of the
407 students drawing is a real problem on the computer. They hate it. It would almost be
408 better if you had some type of a capability for those who needed it where they could
409 draw with a pen on a little board attached to the computer. Because everytime we do
410 one of these projects then they have to draw things and it's gotten worse with the
411 mouse pad than with the mouse. They get so frustrated with that. They'd rather just
412 grab a pencil and paper and sketch it out on paper.(M)

413 If they could have a smartboard type of thing (Sc)

414 Yeah(M)

415 What about a template for geometry with symbols or a math template that you could
416 drag things in?

417 Yeah, word has geometry templates(M)

418 All of our combo notes we've had to go to our Power Point program and drag pre-
419 existing pictures. It's alright but it's kind of nice to let kid create their own pictures
420 too.(S)

421 I have kids, I mean I agree, but I also have kids that will look up pictures on the
422 internet and the picture interest them so they might even take a minute and read a
423 little bit about the picture and I think that's great that...Hey that's cool what is that
424 thing...you know. Like a said it would be nice to be able to say, great, use that
425 picture a put a little caption under it from the internet to be able to click and copy and
426 paste it into...(Sc)

427 Would it be possible...the one thing that I like about our Kansas Assessments online
428 is that when they are in the assessment that's what they are doing and I could have
429 confidence they aren't doing something else. It take over the screen and they can't
430 get out to do anything else...it completely takes over the screen. You can't even get
431 to the apple. Because of security and test validity purposes it would be nice if there
432 is a way you could do that with something like this so that when I'm teaching (M)

433 Everyone muttering agreement on this point....

434 They need to put that in Moodle too. That would be awesome (S)

435 I don't have anything particularly against websurfing or MSN but it takes the focus
436 away from what they are learning. You know...whatever they did with the Kansas
437 Assessment you'd want that in something like this. (M)

438 I agree (S)

439 I have that problem in my A+ class they are suppose to be on the modules, and I even
440 make their computer face me so I can see what they are doing but they are so quick 441 at it.
They can be on a website looking up hotrods and music and when I walk up
442 they are back on their modules.(Sc)

443 That's the beast that I'm struggling with because they have laptops and I'm facing
444 them. So if I see there eyes are wandering, I say hands up and then I go around and
445 if they are on the wrong site then I take their computer away from them for the day
446 but I don't want to be the Nazi.(S)

447 Quite honestly even adults do this

448 Oh absolutely(S)

449 You should hear our faculty meetings (E)

450 I don't even bring my laptop to faculty meeting because I know that I would do that
451 too(M)

452 I had Mike shut down BeBo[website].whatever the other day. He said why and I said that I
453 have a hard time dealing with it in class. It's like myspace.(S)

454 At least during the course of the lesson if you could lock down the screens. Once
455 they are in it it would take over the screen with no menus. Until you're done and
456 you exit out of it(M)

457 You're not going anyplace(E)

458 I know there are programs out there that could initially help that would be doable at
459 first where you can have everyone's screen on you computer to view.(S)

460 The library has that big brother concept(Sc)

461 Ok do you believe a Knowledge Banks tool would be a useful tool in a students overall
462 education?

463 I believe that is an awesome concept to be able to carry that with you year after year
464 because you're right they just end up pitching the notebook. They never know if
465 they'll need to refer back some day. I've saved some of my college notes and I've
466 even referred back to those teacher because I thought it was a valuable course and
467 was pertinent to my subject area but you know you just never know. And to be able
468 to have it right in one spot, to be able to type in and click an go would be great. (Sc)

469 The one really nice thing about Moodle is that when a word that has been defined is
470 use it's grey and students can click on it and get the definition and that's a little bit 471 about
what this concept is without the other connections being made. The drawback
472 is that it's also available during the test and if you as a question to define a word they
473 just have to click on it and they have the answer. (S)

474 I think you'd grab a higher percentage of the students, you know, there would be
475 people on the top end of things that may not like it. It's not how they learn. (M)

476 Even if we use that info daily with a two year gap between World History and
477 American History they loose it. They loose it just in one year when they get to
478 Government from my class. I've told D that we've talked about that stuff a lot but
479 they don't remember it. (S)

480 There is actually a logarithm model for that memory model over time. We studied 481 that
in Trig this year. There is actually a lot of studies on people taught a particular

482 piece of information and tested month after month on the same information but
483 different questions and maybe a little different context and theres actually a
484 correlation between the scores. They go down even if they are tested every month.
485 If they don't relearn it(M)

486 Is there an age factor analysis(S)

487 [Giggles]

488 The way they are being tested they almost have to have things memorized,(M)

489 A good thing with computers if there is a question it's Wikipedia and students find it
490 right away with computers. (S)

491 Ok that is all I have. Thanks you so much for participating. .

8) Would you use this tool in your classrooms if all students had a computer?

1

2

3

4

9) Would the Knowledge Banks tool assist students with making connections to prior knowledge?

1

2

3

4

Appendix E - Student Release Form

Dear Parent(s):

I am a doctoral student at Kansas State University. One of the primary goals is to find ways to help students learn utilizing technology. Participation in this study is voluntary. Your child will be shown a prototype of a tool on a computer that can be used in vocabulary instruction. In a focus group setting of 12 students your child will be asked for feedback on its value and its possible effectiveness in their education. This focus group discussion will be recorded so the researcher can review the comments for completeness. The discussion will last between one and two hours. The primary focus is on improving instruction for students. **Your child may choose to not participate in the research at anytime and it will involve no penalty or loss of benefits to which the subject is otherwise entitled.**

There are no foreseeable risks involved in the study. No student's names will appear on any of the documents used in the final writing of the study. All materials will be kept confidential within the discussions in the focus group. The benefits of the study to the participant include research about learning strategies that could be used in the future of their education. The Results of the study will be mailed to the participants in January of 2007.

The form below will be used to document your permission for this activity

Sincerely,

Denise Guy
Director of Student Learning
Xx Public Schools

Researcher Contact Info: Denise Guy, 422 N Mulberry, Xx , KS 67410 Phone: (785)-263-2630. IRB Chairman's Contact Info: Dr. Rick Scheidt, 203 Fairchild, KSU, Manhattan, KS 66506 Phone: (785)-532-3224.

PERMISSION SLIP

STUDENT NAME: _____

YOUR ADDRESS: _____

I am a parent of the student named above. I have read and understand your letter regarding your participation in the KSU study and agree to the following:

- I DO give permission to you ask my child for feedback regarding a prototype of an educational tool.
- I DO NOT give permission to you ask my child for feedback regarding a prototype of an educational tool.

Signature: _____ Date: _____

Appendix F - Research Questions for Student

Research Questions for Students for focus groups. *Other questions may be asked as discussion develops.*

- 1) What are the graphic organizer tools have you used for vocabulary instruction?
- 2) How often do you review a new term after instruction was given?
- 3) Do you have an organized way of using you new vocabulary from one school year to the next?
- 4) Would you as a students benefit from this?

Review the tool on a projector, indicating the features of the tool

- 5) What are your initial thoughts on the usefulness of this tool?
- 6) Would you use this tool when learning new vocabulary terms?
- 7) Would you use this tool to look up previous vocabulary and review prior knowledge about the terms?
- 8) What other options would make this tool more valuable?
- 9) What types of aesthetic items would make the tool more functional?
- 10) Do you believe a tool like this would assist you in learning and maintaining new vocabulary?

Review the Power Point regarding the concept of the entire Knowledge Banks

- 6) Would this be useful to you if you had you own computers and were able to use it across grade levels from 4th grade through 12th grade?
- 7) Would this change the way you learned new material or documented new material?
- 8) Would this help you remember information between grade levels or curriculum areas?
- 9) What do you see as the down falls to using a tool like this?
- 10) Do you believe a Knowledge Banks tool would be useful too in your overall education?

Appendix G - Student Focus Group Transcription

Student focus Group 5-19-2006

1 7 students in attendance, 16 students were invited. A variety of age, race, gender, and
2 academic level was represented.

3 Let's go ahead and get started. The purpose of this is for my degree at KSU. I had to
4 do a project to finish. As you know I'm the Director of Student Learning for the
5 district so I work with all of the teachers through K-12 so I work with all of the
6 curriculum plus I used to be the technology coordinator. So those two things are kind
7 of my passion. This whole project is kind of a combination of curriculum and
8 technology and I just need your feedback. I want you to be open and honest and just let
9 me know if this particular tool would be of assistance to you for school in the future. It
10 won't be developed before you are out of school unfortunately but maybe down the
11 road. So,,,Here comes C...I'm just going to start out....Hi C...Tell me if you
12 agree or disagree. I have a list of questions that I'll ask you but I have to give you a
13 little preface first. When school starts this is what happens. At the beginning of the
14 school year you come to school with clean notebooks...Right...You get to school and
15 you check out your textbooks...Correct...Then you take notes all year long in your
16 notebooks Then you have many notebooks. You make connections with the text. If
17 you're in a history text, you know where the maps are and you figure out where things
18 are at and as you are studying you make connections with the text. You use graphic
19 organizers to make connections to your prior knowledge. In other words a teacher
20 might give you a piece of paper with some boxes and what not on it and they might
21 ask you something like and what do you already know about this topic.... Mumbling in the
22 background indicating agreement...

23 You end up with a bank of knowledge on paper and pencil. You have your notebooks,
24 you have your books, you have all of this information that you learn all year long year after

25 year after year after year. So from 4th grade to 12th grade you have accumulated about 26 36
notebooks in all of your core academic subjects. Right....

27 (Student) if not more

28 So let me ask you this what do you do with the notebooks let's say next Wednesday
29 when you walk out of here

30 (Student) Throw them away

31 (Student) Trash them

32 Other students in agreement

33 (Student) I put mine in a box

34 Do you ever go back and look at them

35 (Student) Like English and writing

36 That was my prediction. And at the end of the year you give back the text book to the
37 teacher. That tool that you've been using and making connections with all year long
38 and typically kids discard their notes and then they are out the door for summer
39 vacation. Right

40 (Students)...Heads nodding

41 So with that the tool that I'm proposing consists of two different things I'm going to
42 show you. This tool is of the big picture that we'll first look at and for my purposes
43 because of my lack of programming I focused on just the vocabulary portion to
44 develop the prototype. So I'm going to show you what I think the big picture would 45 look
like and then I'm going to show you just the vocabulary part and then I have
46 some questions that I'm going to ask.

47 Alright so my thoughts are with the emphasis in technology there is today we can do
48 better than this for you guys, for the students. I mean we've got a technological
49 world and we are still using paper and pencil. So this is kind of the big picture idea.
50 Let's say we have...This particular... and at the beginning of say 4th grade even we
51 are starting to learn information not just learning to read. We are starting to learn
52 information. So lets say we start to build this tool this database of information so
53 every time you go into a class you have this on your computer, of course everybody
54 will have to have access to a computer. You have this that you can go into for
55 documenting and putting all of your information in. So let's say this is an example of
56 Kori's Knowledge Banks. Let's say she just walked into social studies class so she is
57 going to click Social Studies. So then we have all of the different areas of social
58 Studies and she happens to be in world history so she'll work her way through here
59 and click on World history then at this particular time we are studying about the
60 World Wars so she would click on world wars and we are going to study WWI. The
61 reason it's yellow is because she is now a Freshman so it could be a different color for
62 the different years. So you can kind of search through visually and see what you've
63 learned at different grade levels. So she is going to click on WWI and today we're
64 going to talk about the causes and consequences of World War I. Now I don't know
65 how familiar you are with these different types of tools that the teachers might use.
66 I've noticed lately that teachers are using combo notes. That might be a tool I could
67 put on there as well. But for this demonstration sake we are going to do cornelle
68 notes. Did any of you use cornell notes in Mrs. C's class.

69 G...Uh hum

70 So we'll use that for this example. It could be something you pick because of
71 something you like or something the teacher tells you to use. So we'll click Cornell
72 Notes so this comes up on this side and you can take notes. If you do any projects,
73 let's say you do a Power Point you can attach it down here, this side is your work space.
74 You have the vocabulary that might be placed within different classes and different
75 areas you can seek out and search. Ok. Then you go on. The idea behind this is you

76 keep everything so now when you are in government you can type in government and
77 bring up everything you learned in government. And you wouldn't have to dig
78 through the notebooks in the closet. And you wouldn't have to try to remember
79 everything because every year we are feeding you more and more information because
80 the state tells us we have to. You wouldn't have to try to remember anything you'd
81 have it all in your toolbox to withdraw as you need it with word searches and whatnot.
82 Ok. Now comes to the questions.

83 And I'll just go around the room and let you ask or let you answer.

84 The first question is would this be useful to you if you owned your own computer
85 and were able to use it across grade levels from 4th grade to 12th grade

86 I'll start with you J

87 J: Assuming you have enough computers. How long is the year span as we go
88 through?

89 Researcher: 4th grade through 12th grade is my thought but that would mean you'd
90 need your own computer although you could make it web based so that you wouldn't
91 have to necessarily carry your own computer you could log into a web site get to it
92 that way.

93 J: (very stacy) Would it be just the standard computer or would you get the
94 computer form wherever?

95 H Same question: Yes it would be useful, I don't...again assuming that every one has
96 their own computer or I like the webbased idea to because if we had our own
97 computer it doesn't necessarily mean we would be able to take it home. Ideally that
98 would be good but webbased you'd be able to access it from vacation from where ever
99 you would want to and year round instead of just during the school year so various

100 format.

101 Alright T: I think it would be useful but probably not at the 4th or 5th grade level
102 because when I was in 4th or 5th grade I didn't know how to use computers and all of
103 that yeah but I don't think that 5th graders would.

104 Researcher: So you would say starting at middle school

105 T: Middle school 6th, 7th, 8th grade

106 Researcher: Ok...Good job

107 C: I kind of think the same way as Ted, I don't maybe about 6th grade. Just because 108
when we didn't use the computers much until middle school.

109 Researcher: Did you take notes?

110 C: I don't remember taking notes. Well maybe in Mr. K's class other than that I
111 don't remember ever taking notes really.

112 G: I feel kind of the same way, considering that the technology is changing so much
113 these days possibly the younger we get the more able we are to use computers. But I
114 know since computer, I mean I know they're not new but they are fairly new
115 although 4th grade and 5th grade you don't really know how to type. I just learned
116 how to type in 7th grade. But now like at middle school it would be really neat
117 because we waste so much paper.

118 Other...it's a waste

119 Researcher: Do you every think about "Oh I know I just did that but what was it, I
120 just can't remember?"

121 Student – Today in Algebra, I couldn't remember what we did last week.

122 Student – Would the school provide the computers like to take home or whatever or
123 would you have to provide your own computer.

124 Other student – That's kind of an issue because many people couldn't afford it.

125 Many other in agreement Yah... Yes..that is a problem...

126 Researcher: We aren't going to worry about the cost this is kind of a pie in the sky.

127 Kind of the idea. Because if the idea would go and it would help kids learn then
128 schools might buy into it.

129 Multiple Yeah's and you're right and I agree

130 J: With the way technology has progress I'ts not uncommon for a three year old to
131 know how to use the technology.

132 Others in agreement

133 Researcher: Things are easier to do as things develop. What is your answer to that
134 question.

135 R: Well I don't have a computer at my house either so um. We used notes in
136 American History class and it was kind of hard because we had all of these different
137 folders across our screen. It was hard for me to figure out where WW II notes were
138 vs Vietnam. With this where you're able to search and you can click on something
139 an find it and since we have the internet connected to it that's awesome because I
140 would go to the library and I might have a jump drive or a disk just type in the item
141 and here is my notes from all my classes that year. That would be awesome. The
142 when I come to school at 7:00 or 7:30 I could just go the library or use a friends

143 computer to get my notes.

144 S: I think it's useful because I am not organized at all. I take my notes and I throw
145 them in my locker and I may never see them again. So for organization sake this
146 would be awesome with all of the information in one place. I think it would be
147 mostly helpful in highschool and maybe through 8th grade because like 4th grade
148 wouldn't need it. It's like middle school and on up.

149 R: I remember in C(another school), in history we took lots of notes. I think that if it
150 based on being able to connect on the internet to be able to get on there should be
151 some type of thing where you can only get on this website because I do find that a
152 lot of kids when teachers are talking are getting onto e-mail and instant messengers or
153 look up a blog soo

154 G: But you don't want to have your e-mail blocked because you might need to get
155 on e-mail for an assignment.

156 R: Just when you are asked to use this website during classes.

157 Researcher: Have you taken the state assessment

158 Students Yes

159 Researcher: And you know how that particular blocks you out and you can't get
160 anywhere. I did this same focus group with a group of teachers and this was what
161 they suggested as well. That when you're on taking notes then it would....

162 J: It seems like a way of babysitting your students. You should have to be watched
163 all of the time but you should be able to have the freedom to do what you need to do
164 for the project. This would help with self motivation .

165 R: But some of them just don't have the maturity to do this. I'm not saying block it
166 during the whole class period but just during the period when students are taking
167 notes. Then teachers can still say "Hey guys you have free time get off that website
168 and you can get on the other stuff you know"

169 C: You have students that want to try and you have students that don't want to try.
170 You have students that can sit there and not listen to anything and still pass the class 171 in
fine colors. You just have a wide variety of people. So it wouldn't be fair to just 172 block
everyone. Just because of the five people in your class you can't trust
173 compared to like everyone else who can self focus.

174 R: But I don't know why it matters. If there is like 5 people that are not paying
175 attention and the rest of the class is then why would it matter if they were locked out
176 of the other things.

177 J: Can I ask you a question about the program? Is it relatively easy to use or would
178 it take someone with a large learning curve?

179 Researcher: Well that particular example was only Power Point and I just clicked in
180 different areas.

181 J: This is going to be developed into a program right? How easy would it be to use
182 it. There are classes all over the place trying to teach people how to use Word, Excel,
183 and Power Point as it is would it

184 Researcher: So it would have to be intuitive.

185 R: It would have to be pretty easy to use. It looks like you've combined the three
186 things into one [PP, DB, WP] and that would be awesome because we would have to
187 get into other documents and stuff.

188 Researcher: Um You've kind of addressed my other questions. (Crowd Laughs)

189 No that's great that's what this is all about. Would it change the way you'd learn
190 new material? Part of the research that is out there talks about the fact that we learn 191 best
when we connect new information with old information and that is the thought
192 of the start branch thing. Being able to connect all of the new things with the things
193 we have learned in the past. What are your thoughts on that? Do you learn better
194 when you can connect it with things you already know?

195 H: Yeah

196 R: I kind of liked as an example in American History we are talking about the
197 Vietnam war and we got into this big discussion about Vietnam and we didn't
198 understand what we were fighting over and then Mr. R connected with the current
199 war we are having in Afganistan. It is a lot easier to learn when you compare it to
200 something that is in our generation

201 Researcher: So do you think this tool might help you do that?

202 H: Yeah and I think also you learn a lot if the information keeps recurring. If I learn 203
something 4 times. I might not remember the first and second time but the 3rd and 4th
204 time I think I might have it and I won't forget that then, Let's take vocabulary as an
205 example. I have a pretty photographic memory so I can look at my book 3 minutes
206 before the test, go through the test, and get them all right and then it's just gone.

207 G: That's how I am

208 Researcher; This is a perfect segue into the next tool. You guy's just set it up for
209 me. Good Job H. This is the prototype. It could be used but it has it problems
210 yet. There are some suggestions from the teachers when I met with them and I want
211 your suggestions as well. I'm not a programmer. If I was to develop this further I'd
212 go to somebody who was a programmer and probably maybe even use some other

213 program to make the final product. But this will enable me to show you how it might
214 work. This whole concept is called a Knowledge Banks and I'm just breaking down
215 the vocabulary part of the Knowledge Banks tool. So this is the tool I developed and you
216 are looking at the main screen and if you were to use this. The first thing you would
217 do is enter your grade and subject. The teachers use specific tools to learn
218 vocabulary. I know in your communications class you use a vocabulary notebook but
219 within some of the other ones there are different tools out there that you could. So
220 let's use a concept map where you type in the word, the definition, what might be
221 some examples and what is it like. So we can type in a word. What's a good word
222 here.....Knowledge...What is it like? What you know What are examples IQ, ACT
223 Scores, State Assessment Scores. Now if I needed to do a new word I would just
224 click new word. But the main power of this is that we can search by different areas.
225 So for instance we'll choose search by term. So I would go into search by term and I
226 would type in let's say government and choose that and these are all the things that I
227 have done over the years that have to do with government.

228 Background....Wow

229 And they would come up and then I could click more info and get more info about
230 that word and then go back. So year after year after year of keeping your vocabulary
231 terms together and being able to go in and search out terms and then use them. The
232 thought behind this that you are exactly right J...research says that we don't
233 understand or get anything until we see something 7 different times in 7 different
234 contexts so going into a classroom and learning vocabulary one day taking a test the
235 next and expect the students to know it the next isn't going to work unless you are a
236 genius. Which I know some of you are but so the thought here is that you keep it
237 and then you are able to use them for the papers that you are writing as kind of your
238 own thesaurus with your own ideas and thoughts and definitions. Ok. This tool
239 could be used, We could through it up on the web but there would be a lot of bugs
240 right now so until we actually field test it but before I do that I need ideas and
241 thoughts from different populations of people of which I have teachers and now it's

242 your turn. So my questions are “What are your initial thoughts after viewing this
243 tool?”

244 J: Well it’s impressive. I am a BASIC programmer and I know some programming
245 but my concerns would be the searching and how you would get the searching
246 mechanism to work. How exactly would you set up a situation where you can search
247 out what you are wanting. Or organize the words in categories, have a section for
248 word lists.

249 Researcher: Ok, this particular program, I can’t remember I haven’t looked at this
250 for a while. Here is the search field. Here is the combination I used for this tool.
251 Those are good things and things we have to be considerate of as we move forward
252 on this. Good Stuff

253 H: Um WOW. How long did it take you? I’m just curious.

254 Rearcher: this tool?

255 H: Yeah

256 Researcher: You don’t even want to know. I’ve been working on my degree
257 actually I’ve never stopped going to school and never stopped learning and I’m forty
258 three years old.

259 H: This is a cool program. Good idea good all the way through

260 S: I think its good because then we could let teachers know that we’ve already
261 covered something. We go to social studies and you keep hearing the same thing.
262 You take the same notes. Like with this, you take the notes one time, and if they
263 discuss it again you just bring it up and you can just review your notes. I remember
264 back in 8th grade and they still teach you it like right now.

265 [Others in the background:] It looks really good to me [with agreements]

266 H: How much memory would this take for 1000 students.

267 Researcher: I don't know, I really haven't done the research on it yet

268 J: You'd really have to build up the memory.

269 Researcher: You could put it on servers and people would log in through

270 H: So would this be available after high school?

271 Researcher: Well right now I was thinking 4th through 12th grade but we could go 272 further with it. If it's worth pursuing

273 H: I think it worth going further with it

274 R: It would be great to have it for college

275 H: It would be great for high school

276 J: Yea particularly if it was web based. But what would happen if the circuit would
277 break or you'd lose it.

278 Researcher: you'd have to have all kinds of precautions for that. You'd have to back
279 up and all of that.

280 H: Our server doesn't crash very much really.

281 S: I think it would be good if you used this like at 8th grade on and through high
282 school and then you have it in college it would be really good. You would probably 283 get
your own computer there.

284 R: I kind of think we're back to point of where we were talking about using this in
285 4th grade and on up. Once you think about it if a kid would have a program like this
286 they could put all of their learning into it they would be. It would be better how to
287 teach kids how to do this stuff at a younger age. If they could start at 4th grade cause 288 I
know you have to start some where with typing by yourself I mean this would be so
289 helpful that just to think of how all the kids
290 [student sneezed and everyone laughed]

291 but um I think it would be great. Maybe you could have different levels. A more
292 advanced option for high school than for children.

293 Researcher: I haven't heard anything from you...

294 T: I like the fact that you can just type something in and your information is there.

295 R: That's awesome to be able to type in a word and all of the information just pops
296 up instead of digging through these notebooks and going back and asking when did
297 we learn this...I think in August.

298 H: It's almost like Wikipedia-ish

299 Researcher: It is except it would be Hepedia [meaning a student name – epedia, since it's
the students encyclopedia]

300 S: In American History, I like that we take notes on computer. It's a step up from
301 paper pencil but at the end of the year the whole thing was like filed here and filed
302 there. Mr. R is like just drag it in to your notes folder but then you ask "ok were is
303 the notes over this" and you have to open up all of the notes and think oh this isn't
304 the right one where is it.

305 Researcher: So when you take notes it's basically in the word processor?

306 H: Yea

307 S: And we are just saving it and there is no way to really search through it. You just
308 have to go in and out of your documents. It was like a step up because it's so much
309 better than paper and pencil but it's just so hard to search for in on the computer

310 H: You have to be real careful how you name things.

311 R: Yeah you get in a hurry and just name it something then you don't know what 312 you
have. I've lost a lot of notes because I'd leave it on the desktop and someone
313 would throw it away so. But with this to be able to type one word in and find it and 314
having it all connected together would be great.

315 Researcher: Do you think it would be wise to take the next step and try to develop
316 this tool further?

317 [Background:] Yes and Wow and definitely. It would be so helpful. I really think so.

318 Researcher: Looking at the vocabulary tool, and I know it's somewhat rough, can
319 you think of anything that would make it better? Are there other things that help you
320 to learn vocabulary that aren't in this tool?

321 [Several Students:] Pictures

322 Researcher: Being able to draw or paste pictures

323 [Several Students:] Yes or like drag them from the internet

324 Researcher: There are a couple of different graphic organizers available to use but

325 actually the teachers came up with that same point of being able to draw as well.

326 [Several Students:] Pronunciations would be good as well.

327 Researcher: The other thing that you can do is search by grade level and content area
328 so if you want to get everything you learned in one year you could pull all that
329 information up and sort it alphabetically. So all the terms you learned in a particular
330 year or whatnot can be found. And you can also pull out what you might have done
331 in a particular day in case you need to print it out or something.

332 H: We would need to date each word then?

333 Researcher: No it automatically dates itself.

334 H: Oh Wow.

335 J: Then are you the only one that can access it. Like if I had it G couldn't get
336 on mine?

337 Researcher: It would have to be password protected.

338 J: So it's like you were connected to the server?

339 Researcher: Yeah if you keep your password private then know one would be able to
340 get in your bank. There are two ways we could go about this. We could have it on
341 individual laptops or on the web.

342 R: Like how we connect to the server with all of the folders we have?

343 Researcher: you would go onto a website and type in a password and username.

344 H: xxschool2.org

345 R: That would be kind of cool but no schools around here will be able to give
346 laptops to kids so connecting to a server would be awesome. We're allowed to do
347 that here. Or internet based like Moodle we can get onto the information from home
348 as well.

349 Researcher: You've kind of addressed this but you believe a tool like this would assist
350 you in learning vocabulary and maintaining a new vocabulary

351 C: Yes, yes, it would be like very organized and I hate being unorganized.

352 G: an audio part would be cool

353 Researcher: Would you use this tool

354 [Several Students:] Oh yeah, yes...

355 R: In the future grade levels you would want to be able to look up words also.

356 Researcher: What do you see as the downfall...

357 R: not enough computers, money, having enough at the school, Some
358 people might have a hard time learning the tool. Will special ed be able to learn
359 how to use the tool. It needs to be easy to figure out how to use.

360 J: It would need to be intuitive,

361 Researcher: ok. Any other downfalls.

362 H: I can't think of any,

363 J: The program itself is good other than that it's things like will it crash and
364 other technical issues,

365 S: you would have to have things like they have on a computer where if you
366 have problems you can call or e-mail someone.

367 Researcher: That's all I have for you.

Appendix H - Preliminary Field Test Student Focus Group

10-5-2006

1 What are your initial thoughts on the usefulness of this tool? (Researcher)

2 Pretty useful tool, just uh, the concept is really good. It would be really handy to uh for
3 a kid maybe third grade up or so to have this. But it would only be useful if a kid was
4 able to manage a laptop. (J)

5 What do you think? (Researcher)

6 I liked the tool a lot. I found it easy, well easy for me, I found it useful because it had
7 all of the different ways to do it. Like the Frayer models and it had all of those different
8 types of forms and I like that. I would just be worried if a kid could carry a computer
9 around all of the time. I struggled with this the whole week. But the program I like it's
10 easy to access. (G)

11 Right now I'm trying to figure out if my computer is on or off (R)

12 I thought that it was a really awesome program and I like the fact that. I also forgot
13 my charger....The program was really awesome. I liked how when I was in Pre-
14 Calculus Monday and we talked about domains and functions and we would go over
15 our questions or whatever and on Wednesday all I had to do was go "Oh, domains"
16 and everything I learned popped up on that. I like the fact that I could just pick it up
17 and look through it. I mean it was nice having that right there, you know, being able
18 to just scroll through something and find something. The only problem was that it
19 was a distraction because I wanted to sit there and play with it and figure out how to
20 do the recording features and stuff. But it's awesome that I can just click on a button
21 and then there was a picture of a function right there for me and it was fun. And a lot
22 of people thought it was really cool. A lot of my peers looked at it and they thought

23 that it was just awesome how they could just type in some stuff and it was right there,
24 you know. (R)

25 OK. Would you use this tool when learning new vocabulary terms over time? (Researcher)

26 It would help because it includes all of the study techniques in one useful program. It
27 would be able to be useful when you are writing essays in journalism for example or
28 such to have that expanded vocabulary from English alone. Nobody ever remembers
29 the words we learn. (J)

30 I definitely think it would. And just the fact that you could have all of your past words
31 would be helpful in that sort of way. (G)

32 I like the fact that you can just type it in and you can have pictures and stuff. You also
33 have the audio and stuff so you can record. A lot of people learn in different ways,
34 like we said, the pictures and audio. Just saying the word in your own voice would
35 help. And I like the fact that. And it would help with vocab. Just because you can go
36 over and over again the words and not have to look at a boring piece of paper. You
37 don't have to draw your own pictures or whatever. I liked that. (R)

38 Ok um would you if you had your knowledge all stored for the past 6 years would you
39 use this tool to look up your previous knowledge? (Researcher)

40 Um Yeah I certainly would (J)

41 I definitely would. If there is an American History assignment and we've gone over
42 the Holocaust or something and you already have written all of this information on it,
43 it would be helpful to know that we have already talked about this in classes. We write
44 the same information over and over. (G)

45 Ok (Researcher)

46 I think that it would definitely improve the way we speak and stuff with the vocab and
47 stuff. Like you just said history, math everything. I thing that the way we speak
48 would be so improved because we would be using those vocab words instead of
49 learning them and then forgetting about them. (R)

50 Ok. What other options could you see that would an added benefit to the tool? We
51 added the file, the graphic, the audio, the webpage and the URL and the different
52 models. What other things do you think might be worthy of putting on this tool? (Researcher)

53 There is nothing that comes to mind right off the top of my head but maybe a few
54 technical things. Like for example if I were to type a word in and it was misspelled it
55 would underline in red and I would be able to control. (J)

56 That is on the thing though. I knew as I'm trying to type things as P is speaking and
57 Oh this word is spelled wrong. It's got that already. (Researcher)

58 I didn't see it. The only other thing would be uh to be able to transfer vocab words
59 and put them into a different format possibly although I'm not sure exactly how you
60 could do that but I mean uh for the purpose of this program you'd have to hold all of
61 this information for an extended period of time and you would want to be able to uh I
62 mean if the computer would crash or computers get old you want to be able to transfer
63 all of the information and be able to condense it all into a smaller format because a
64 computer can only hold so much. (J)

65 Ok (Researcher)

66 As far you know what comes to my mind right now is that it has everything that I
67 would need to help me remember vocabulary. I mean it has the pictures and
68 everything. The only thing I had trouble with was um when doing the pictures you
69 had to go out to desktop to do them and it would be nice to be able to go directly to the
70 web to get to them. I was looking at diffusion and I needed a picture of diffusion and

80 so I had to get on the internet separately. It would be cool to put that on to it. (G)

90 So have a link within there that says click here for internet link and go right to Google
91 images. (Researcher)

92 Uh Hum. But everything else was there (G)

93 The only thing I could think of is if kids could put it on their jump drive and be able to
94 take it home and use it at home too. (R)

95 Ok now do you think this as we see it as one piece of the overall Knowledge Banks
96 where you include all kinds of other ties and connections. Let's say tomorrow I say
97 alright this is ready for release would you choose to use this tool to help you in your 98
learning? (Researcher)

99 I would certainly through college. (J)

100 Oh my gosh yes (G)

101 Uh also if I could find a way to use it with more than just vocab words or
102 terminology. Or have a way you take simple notes and I noticed you did have a
103 section for notetaking. (J)

104 What I liked about how we search is we could put in a word let's say Hitler and it
105 would bring up all of the stuff throughout the bank about him. Like it might be
106 included in Holocaust. You know what I mean? (R)

107 Yeah it searches the other fields as well for the term (Researcher)

108 Yeah and you click on that and then you will have all of the information about all of
109 those. And that's what I used it for too. To be able to have that wide range of when

110 you type in one little word and suddenly you have all of the things related to it (R)

111 Yeah that was nice (G)

112 That was cool (R)

113 Any other things that you think would make this tool better or any other comments

114 you'd like to make? (Researcher)

115 I would definitely get rid of the notebooks, the planners, everything if I could just use

116 this. (G)

117 Especially if you could down load it to a jump drive. The only problem I see is for

118 some kids that don't have computers. I don't have a computer so it would be a

119 matter of being able to get to the libraries so if we had the ability to just put it on a

120 jump drive that would be awesome (R)

121 If you have your own connected servers you could simply put this uh software, of

122 course working out some technical difficulties, and have available at the school here

123 I think it would be very accessible on the computers within the school. (J)

124 My next step would be to, and I'll write this in my paper, would be to get it

125 completely web ready. I can make it web ready but we can not add graphics or files

126 through the web. You could see them all once they're added but you take that step.

127 So in my next steps that would be one of my recommendations. Then you could just

128 log onto the web wherever you are at. If you are at grandpa's and you want to log on 129

and look at your Knowledge Banks you could. (Researcher)

130 With the password? (R)

131 Yeah with the password (Researcher)

132 Well I graduate in 07 you have some time to get this ready for me. I'll be ready for
133 my copy of it. You can give it to me for a graduation present. (R)

134 I'll work on that. (Researcher)

135 I would definitely use that in college especially in college, that would be so helpful.

136 That would be extremely helpful (R)

137 It would. (G)

138 I mean the last four days having it has been great (R)

139 Do you need me to print out what you guy's have done? (Researcher)

140 Oh no I wrote everything down as well (R, G, J)

141 You didn't have any real technical difficulty cause I didn't hear from you. (Researcher)

142 The only thing was when I recorded I didn't know how to replace it with a new one. (J)

143 If you just click on it and hit your delete key. I should put that in there though. (Researcher)

144 I think that the audio tool bar should just stay up the whole time because it

145 disappears(R)

146 Ok (Researcher)

147 Are you thinking like maybe in the future if this does get out to maybe expand it to

148 something that we can use? (G)

149 Well I would like too. Would you like to see it happen for xx? (Researcher)

150 Yes do it. Finally someone is thinking about us and how to make things easier and
151 more efficient for us. (G)

152 We have many other tools like Powerschool and our servers this would be the one
153 thing that we have that is ours. It would be awesome to click on our things and it's all
154 ours. (R)

155 There would be like a million different things you could have (G)

156 I have like a folder for each class and in every folder I have more folders. If I could
157 just click on the Knowledge Banks and I have all of that information there it would be
158 like twenty folders I would have to go through. (R)

159 Thanks for helping me out(Researcher)