

TEAC 859, Instructional Message Design Papers

The books read for this course include: *The Design of Everyday Things* by Donald A. Norman; *e-Learning* by Ruth Clark and Richard E. Mayer, Jossey-Bass; *Designing Effective Instruction* by Gary Morrison, Steven Ross, Jerrold Kemp. The following is a document including all of papers that I wrote based on these books.

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ICML Discussion

In your view, what is the biggest take-away message from the ICML? Discuss.

The biggest take away message from the Interactive Compensatory Model of Learning (ICML) in my opinion was the discussion for instructional strategies that teachers can use to improve each component, and therefore, promote learning. This is important because it looks at practical applications for applying the model in the classroom. It also promotes the idea that teaching students to make better use of the individual components of the ICML can improve learning. The components of the ICML that the article offers suggestions for improving upon in the classroom are cognitive ability; knowledge; strategies and metacognition; and motivation.

For improving cognitive ability, the article suggests that although it maybe the most difficult component of the ICML to change there are ways to increase it by teaching critical thinking and reasoning skills. Several programs have been developed and tested that promote incremental change in cognitive ability. The programs include the Productive Thinking Program, the IDEAL Problem Solver, the CoRT Thinking Materials, and the Feurstein Instrumental Enrichment (FIE) Program. FIE provides exercises organized and called instruments. It is most successful when teachers are well trained in FIE and when students receive at least 80 hours of FIE training.

In relation to the second component I will discuss, knowledge, there is no doubt that it can be changed through classroom instruction. It is just a question of how and what knowledge is worthwhile to develop. There are three main approaches that are believe to promote knowledge development including direct, socially mediated, and autonomous learning. It is believed that all three approaches can be used and can be effective. It is believed that it takes five to ten years to become an expert on a subject. A combination of all three approaches is promoted as the best means for developing expertise and to promote the development of knowledge.

The next component that we will discuss improving is strategies and metacognition. The development of strategies is one of the best suited for classroom learning because it can be done quickly in comparison to the need to change ability. The development of strategies can do more than just improve learning. Strategies can help students become more independent and have more confidence in their abilities. There are three times when strategies should be used before, during, and after learning. Those good with strategies are competent to some degree with all three.

The final component to discuss is motivation. It is believed that motivation can be increase in a variety of ways. The first means for increasing motivation is self-efficacy. Self-efficacy can be improved through modeling, feedback, and assessment.

This summary on the article called, Improving College Teaching Using an Interactive, Compensatory Model of Learning address the message that I felt was the most important one to take from this article. In my personal opinion, the most important information

presented in this article was on the fact that model components can be improved through learning and classroom instruction. I think that this is important because it provides teachers with direction for improving the model components in their students. I would not have guessed that cognitive ability was a component that is malleable but this article presents strategies for improving upon it.

ICML Article Reaction

React in writing to the instructor's views expressed in the article: Improving College Teaching Using an Interactive, Compensatory Model of Learning

The older I get and the more that I have learned about learning, the more I wonder how I can apply what I am learning to my own experiences as a student. Growing up I often wondered why school, tests, and learning in general seemed to come easily for me and more difficultly for other students. The Interactive Compensatory Model of Learning (ICML) helped me come to an understanding of this to some degree. School has gotten more difficult as I have aged, but I also realized as I was reading this article some of the strategies I have used to compensate for this fact.

The five components of the ICML seem very straightforward and highly interconnected when it comes to learning. I found several aspects of the model that were discussed in the article to be extremely interesting. Of particular interest to me within the context of my own personal experience were the fact that learners compensate for weakness through the use of strengths in other areas, the possibility of improving upon the skills outlined in the model in the classroom, the use and development of strategies for learning and motivation. I will be discussing strategies in greater depth in my response to the second discussion question so I will not focus as heavily upon them here.

I found the assertion that learners compensate for weaknesses with their strengths to likely be true based on personal experience. Referring to the ICML, I feel that my strengths were in the areas of cognitive ability, likely inherited from two highly achieving college educated parents, metacognition and motivation (depending on the subject matter). My personal weaknesses then were within knowledge (again depending on the subject matter and also age in this case), strategies, and motivation if I was uninterested in or afraid of the topic being addressed in the course I was taking.

The possibility of improving the skills included in the ICML presents an exciting challenge to me. Growing up I really wish more had been done to help me improve my learning strategies. I did learn some things in the classroom but feel that I would be a better student today if my teachers had placed a greater emphasis on this. As a teacher myself, I will remember this and will try to bring it into my classroom. It does not sound easy to accomplish to me, however. I feel that I could benefit from some additional real world examples of teaching strategy in the classroom.

I considered motivation both strength and a weakness for myself for a variety of reasons. The main reason that I placed it into both categories was subject matter. If I already have an interest in the subject at hand I am much more likely to want to learn more about it. If I have no interest in the subject or if for some reason I resent the subject or feel that I am incapable of excelling the subject. I am less motivated to learn about it. I think that based on this it is particularly important that teachers try to make connections between the subject that they are teaching and the student's daily lives and personal experience. I

think that by doing so they will be able to increase their motivation towards learning the subject, and therefore, increase the student's level of learning.

I think that the ICML has a lot of important implications for use in classrooms. I think that it is important for teachers to refer to it and attempt to improve their student's skills in each of the five areas addressed by the model. By doing so, the student will not only improve their learning in the subject matter for the course, but also improve it other subject areas as well.

Use the new terms introduced by Norman to describe an instructional problem in your current setting. For example, is there a situation in your work environment where feedback related to performance is so sparse that work quality may be impaired?

Norman Application

Write a description of how the principles set forth by Norman apply somewhere in your school or workplace. Try to focus on something that follows the principles very well or very poorly, and be prepared to discuss and defend your selections.

An example that I think does a good job of following Norman's principles is a very simple page on the AIROS website with links that allow you to listen to our live audio stream. I will discuss why I think it is a good example in Norman's terms of feedback, mapping, gulfs of execution and evaluation, and memory.

The first principle that I will look at is why I think that the link on the AIROS website is a good example in terms of Norman is feedback. The reason this is such a good example is you get feedback. When you click on the listen to audio link, you hear audio and your Real Player program opens indicating how long you have been listening. If you do not happen to have your sound turned on or Real Player installed, something still happens and based on what occurs you can determine what to try next to get the audio to play properly.

The next principle that I feel is followed well in this example is mapping because I feel mapping is followed in several ways. It is followed in the placement of the links on the listen to audio page. There are two links of this page that will take you to audio. One on the left with the main navigation for the page where one might first look for a link, and the second in the text that you read to learn how to download the Real Player. The other mapping is conceptual related to what you expect to happen when you click on a link on the web. When a user clicks on a link, they expect some action to happen. If they click on this link, they are taken to the live stream so action is occurring like they expect.

The principle of Norman's that it does the poorest job of following is the gulf of execution. The problem does not exist so much with the option of clicking on two different links to get the same result, but with what can happen after you click on the link and you are expecting audio. Unfortunately, the only way you will get audio is if your speakers are on and if your Real Player is configured correctly. If this is not the case, then it is not completely clear what needs to happen next. The user can adjust their audio volume but that will only solve the problem if they have Real Player installed.

I would argue that it does, however, do a good job of bridging the gulf of evaluation. The reason it does this well is minimal effort is needed to determine that the user's expectations have been met. When they click the link, something happens that they can see physically regardless of whether or not they can actually hear audio. If they can hear audio, however, it is highly apparent that they succeed in what they intended to do.

The final principle of Norman's that I will discuss is memory. I feel that my example follows this principle well and quite simply. The number of items that a person can hold in short term memory is five to nine. The number of links in the left hand navigation that a

person has to choose from on this page is five, which is well within the limit and prevents the person from becoming overwhelmed by links.

I will conclude with a summary of why I felt my example was a good but not perfect one. I discussed how it provided both good feedback and mapping, both physical and conceptual. I considered how it fails with the gulf of execution. Fortunately, this is not always the case and it does at least provide feedback when it does not work successfully. I finally considered how it succeeds with both the gulf of evaluation and the user's short-term memory. Overall four out of five is not bad.

Clark & Mayer's View of Multimedia

Describe Clark/Mayer's view of multimedia. Describe Clark/Mayer view of how humans process images, oral text, and written text.

Multimedia is a term that gets thrown around and used a lot when discussing e-learning. The definition for multimedia, however, is not always clear but is just as important to consider as the term itself. In the text, *E-Learning and the Science of Instruction*, the authors Clark and Mayer provide a definition that is explained and used to describe some of their principles. The definition they use is important in terms of how humans process information as well in terms of written text, images, and oral text. Clark and Mayer use their definition of multimedia and how people process it to make recommendations for designing e-learning.

Clark and Mayer define multimedia in terms of a multimedia presentation. They state that we use the term multimedia to refer to any presentation that combines both words and pictures (Clark & Mayer, 2003, pp. 54). They further define words as either printed text that is read or spoken text that is heard. Pictures include any graphics from static illustrations like charts or maps to dynamic graphics like animations or video. This makes for a simple, straightforward definition that they then use to make recommendations for creating e-learning courses.

The main recommendation that they make is that e-learning courses use both words and pictures. They call this recommendation the multimedia principle. This recommendation is based on the fact that people understand material better when they engage in active learning. Active learning is accomplished through the use of multimedia due to the connections learners make between the words and pictures that they see. Active learning is important because it is based on a cognitive theory where learning involves actively making sense of what you are taught and teaching is attempting to foster cognitive processing within the learner. Clark and Mayer consider an important part of active processing is to mentally construct pictorial and verbal representations of the material and to mentally connect them (Clark & Mayer, 2003, pp. 60). Based on this they suggest using pictures and words that represent the same things, and therefore, help the learner engage in active learning.

Clark and Mayer support this principle by reviewing studies and finding that the results are consistent with what they suggest. They call the finding that people learn more deeply from words and graphics than from words alone the multimedia effect (Clark & Mayer, 2003, pp. 61). While the bulk of evidence seems to support both the multimedia principle and effect, one must begin to question why this is the case. There must be more to this than simply the active learning that Clark and Mayer suggest takes place as a result of multimedia. Stronger evidence for this effect and principle is put forth as they discuss them in greater depth and begin to suggest how processing is taking place as a result of using multimedia.

Most of the learning principles set forth by Clark and Mayor use and consider the cognitive learning as a base for explaining why they work. I have already touched on this theory in my discussion of the multimedia principle, as it is important to consider it in terms of how people process information. The ideas that it asserts are: there are two channels for processing information, human memory is limited in its information processing capacity, learning occurs through active processing in memory, and knowledge and skills must be retrievable from long term memory to be transferred. In this system, a lesson's multimedia is transferred through starting at either the eyes or ears, briefly entering sensory memory, and then is finally move to permanent storage in long-term memory. The system is important because it helps explain the limitations of human learning and becomes the backbone for how we process multimedia.

My discussion will conclude with Clark and Mayer's view of how spoken words, written text, and pictures are processed. I have touched on it throughout this discussion as I have considered the various principles they cite to describe multimedia processing. The main premise of their view relates to the two sensory channels of the cognitive learning theory. Spoken words are processed appropriately by the auditory channel. Written text and pictures then are processed by the visual channel. Both of these channels have limited capacity and therefore should not be overloaded. Based on this and according to modality principle. It is better to combine spoken words and graphics to avoid overwhelming the visual channel and prevent making connections between, and therefore, learning the material.

In this paper, I have looked at multimedia in depth. Considering its definition, the best means for presenting it to achieve learning, and the ways it is processed. I concluded that according to Clark and Mayer multimedia is a combination of words and pictures. By combining words and pictures, people are better able to learn through the connections made during active learning. The effect is even more powerful if the words are spoken and taken in through the audio channel because this prevents the visual channel from taking in too much information. Based on this, I would recommend following Clark and Mayer's modality principle and combine spoken words and graphics to achieve greatest long-term retention.

Clark & Mayer's Learning Principles

Enumerate the learning principles cited by Clark/Mayer and then select the one you find least believable. State why, and suggest tests that could be made to challenge this principle.

The first principle I will enumerate is that contiguity principle. This principle suggests that when using multimedia, it is important to place words describing the graphics near the graphics they refer to. They provide evidence that this should be done by explaining it takes fewer cognitive resources to make connections between the pictures and graphics when you do not also have to connect them on the screen. This is particularly important due to the limited capacity of working or short-term memory.

The modality principle, which is the next one that I will discuss, makes considerations for the limitations of not only short term memory but of the channels used to get information into short term memory. The modality principle involves presenting words in an audio format rather than on screen text. The primary reason for this suggestion is to reduce the demands on visual processing. Clark and Mayer consider this important because humans use multiple channels to process information. In this case, there is both a visual/pictorial channel and an auditory/verbal channel present. They suggest both have limited capacity such that the visual channel can be overloaded by trying to process both on screen words and pictures. They support these principles with research and assert "people learn more deeply from multimedia lessons when the words explaining concurrent animations or graphics are presented as speech rather than onscreen text (pg 93, Clark & Mayer, 2003).

The redundancy principle will be considered next as it also looks at processing channels and again suggests that it is possible to overload them. The redundancy principle answers the question of whether or not it is effective to present words both on-screen as narration to have kind of a doubling effect. Clark and Mayer say that this should not be done again mainly to avoid overloading channels. Their primary concern is the onscreen text would compete too much with the graphics, and therefore, interfere with our ability to process them. The thought of giving learners a choice between audio and printed words is based somewhat on learning styles that because people learn differently why not try to target both audio and visual learners. This according to Clark and Mayer does not consider the limitations of a human's processing channels or short-term memory. They feel that the presentation of both graphics and onscreen text to the visual channel will overload it, and therefore, limit the ability to process the information and make connections.

The final principle to look at is the coherence principle. According to the coherence principle, adding interesting but extraneous material can hurt learning. Clark and Mayer consider this principle in terms of sounds, pictures, and words. Their primary conclusion is that less is more. Designers should only present the information that is relevant to the learning to avoid overloading the information processing system given its limited capacity. They also suggest that extraneous information could "distract, disrupt, or

seduce the learner's process of knowledge construction (pg. 128, Clark & Mayer, 2003).

Now that I have enumerated Clark and Mayer's principles, I will refute the one that I find least believable, which is the redundancy principle. As I considered this principle, I thought that there at least should be some situations where receiving the same text in both the audio and visual channels is advantageous to the learner. Clark and Mayer cite some examples including when there is no image, when the pace of the material presentation is slow, and when a large cognitive load is placed on the learner. To me, this is a lot of exceptions to place on a so-called "principle". The first thing that I decided to try to do was look for research that supports the presentation of the same words in the audio and visual channels. I found an article by Lewandowski and Kobus titled "The effects of redundancy in bimodal word processing", the findings of which refute the redundancy principle. Their result showed a significant gain in word recall when the same category word was presented concurrently in the auditory and visual channels (Lewandowski and Kobus, 1993). The same article cited a study by Miller in 1982 in which he proposed that this effect was the result of a "coactivation" model stipulating that redundant targets independently produced activations that were summed together prior to making a decision and a response. Throughout this article the authors cite additional research that is contrary to the redundancy principle.

To challenge this principle, one would need to develop a study that determines a reason for the inconsistencies found between the work of Lewandowski and Kobus and Clark and Mayer. My personal theory regarding this is that there must be a limit to the amount of redundant information the information processing system can handle at one time. I say this because it appears that in the studies reviewed by Clark and Mayer the amount of redundant information is inferred to be quite large (complete lessons). However, Lewandowski and Kobus limited the list of words to be recalled to fifteen. Somewhere within this range of fifteen words to complete lessons there must be a point when redundancy becomes ineffective and cause an overloading effect like suggested by Clark and Mayer. The additional tests that I would suggest would seek to find this ceiling. Studies could be modeled after those of both groups of authors with the goal of finding this cut off point. This number may suggest what the capacity of sensory memory (the audio and visual channels) is. Apparently, it is larger than that of short-term memory but just how large would have to be determined in a controlled study.

Examples of Using Clark & Mayer's Learning Principles

Provide URLs for two Web sites about learning. Choose one that illustrates well the Clark & Mayer's principles, and one that violates these principles. Review your own work. Cite one case where you have violated a Clark & Mayer's principle, and suggest ways in which you could address that problem.

In this paper, I plan to review three websites in terms of whether or not they follow the design principles put forth by Clark and Mayer. I will look at two websites designed by others selecting one that I feel follows Clark and Mayer's principles well and then discussing a second that does not follow them. The third website that I will review will be one that I designed myself. I will be looking to find one way that it violates Clark and Mayer's suggestions and will make recommendations for improving it.

The first website I will review is called the "Discreet Fire 7 and Discreet Smoke 7 Tutorial Videos". I chose this website because I feel that it does a good job of following Clark and Mayer's principles, and I will describe why. First of all it uses both words and pictures to present the instruction, and therefore, follows the multimedia principle. When text is used to describe images in these lessons it is placed near the image it describes, and as a result, takes advantage of the contiguity principle. It also follows the modality principle through its use of audio narration throughout to accompany the images that are being described. The redundancy principle is followed because onscreen text is removed when other visuals are present; therefore, the visual channel is not overwhelmed. It finally keeps with the coherence principle by not adding any extra words or images that are unnecessary.

The second website that I will review is www.froguts.com. In my review, I will specifically look at their demonstration of a frog dissection that is available as a subscription service. The full dissection used to be free and this website has always fascinated me so I thought it would be a good one to look at. Unfortunately, despite the interactivity that it utilizes so well and the frogs that it saves, it does not follow the design principles put forth by Clark and Mayer well. It does not violate all of Clark and Mayer's principles as in my view it follows the multimedia principle well because it uses both words and pictures throughout the demonstration. The central image is that of the frog image, but it also includes images of the tools used to dissect the frog. Words are used to describe the steps to take and to identify the dissection tools. It does not, however, follow the contiguity principle especially with the tools. The descriptions of the tools are placed in a box below them. It is close to the lower portion of the tools but is some distance away from those at the top. I think that a more effective way to have had structured this would have been to use a form of tool tip that appears when the user rolls over the dissection tools. This would place it over the tool it is describing and prevent confusion. This website also does not follow the modality principle (Probably due to bandwidth. They do say that the full product includes narration). It provides onscreen instructions where it would be more appropriate according to the modality to use audio narration since the visual channel already has the image of the frog to take in. Since it doesn't use audio, it does not violate the redundancy principle. However, if an audio narration were

added, I would recommend removing the onscreen text instructions to avoid violation of the redundancy principle. It slightly violates the coherence principle in that it uses a few extraneous sounds that are unnecessary for presenting the material. Most are appropriate but not all. It also does not take advantage of the personalization principle because the instructions are not written in a personal style using the appropriate pronouns. The style of writing does not seem exactly conversations either. They could have had the instructions delivered by a dissection coach to accomplish this along with improving upon the writing to make it seem as the coach was speaking directly to the learner.

The final website that I will look at is one that I designed for a graduate class and that covers the topic of intrapersonal intelligence. I wish that I could say that it follows all of Clark and Mayer's principles to a "T"; but to be honest, it does not. Partially because I was not aware of them at that time and also because I come from somewhat of a artistic/design background rather than an education background. Not that it hurts to have these skills, but I think that in the case of this website they do. I feel that the main principle that I violate in this case is the coherence principle. I designed the page with multiple extraneous graphics, which are not needed to present the message of the material. In fact, none of the graphics on the page reinforce in content of lesson. They looking nice but they are not necessary and likely detract from the subject at hand. As far as how I could improve on this, I think that I could try to find a graphic that connects to and reinforces the material I discuss. I do not think this would have been impossible to do and I could apply the same effects that I used to it to achieve what I wanted to visually as well. Doing both would improve a learner's ability to retain the messages that I was trying to get across in this lesson and still look nice graphically.

I just reviewed three website according to the principles used by Clark and Mayer. It was easy to find websites that violated these principles, and a lot harder than I expected to find one that followed them all. The one that best demonstrated their principles, however, looks like it would also provide the learner with the most likely to be retained and transferred skills.

Comparison of Norman vs. Clark & Mayer

Compare and contrast ideas from Norman with those from Clark & Mayer.

In this discussion, I will compare and contrast the ideas of Norman versus those of Clark and Mayer. In the books that I read by these authors, they discussed and give suggestions for designing objects. The focus of Norman's ideas were everyday objects and preventing errors. I will be relating them to Clark and Mayer who focused on the design of multimedia materials to facilitate learning. I will consider the ideas of these sets of authors in terms of feedback, natural mapping, gulfs of execution and evaluation, and memory capacity and processing.

The first common thread between Clark and Mayer and Norman that I will look at is feedback. All of these authors consider feedback to be an important part of designs. Norman believes that objects should provide clear feedback that an action that you performed on them has some kind of effect. Clark and Mayer consider the placement of feedback in relation to the questions asked important in multimedia instructional designs. They feel that it should be clear which question the feedback is related to. They also believe it should be placed on the same screen as the question. The main commonality between their ideas is that feedback should be visible and clear.

The next point that I will compare Norman to Clark and Mayer on is natural mapping. According to Norman, items that are closely related should be placed together. Then items that are less related should be placed further apart to communicate that they do not belong together. Clark and Mayer have a principle that is similar to this that they call the contiguity principle. This principle suggests that when using multimedia, it is important to place words describing the graphics near the graphics they refer to. All of the authors agree that doing these things will minimize the cognitive resources used by the user or learner to process the materials. This is accomplished through the connections that the person makes between the related objects. Both authors suggest that taking these actions will improve the user's ability to use or learn the item in question.

I will discuss the gulfs of execution and evaluation next. Norman uses these two terms in his work. Clark and Mayer do not, but I think both can be related to their learning principles. The gulf of evaluation is a system providing physical representation that can be directly perceived and that is directly interpretable in terms of the intentions and expectations of the person (pp. 51, Norman, 2002). The gulf of execution is the system providing reactions that correspond to the intentions of the person (pp. 51, Norman, 2002). I would relate these gulfs of Norman to the general suggestions that Clark and Mayer give for designing instruction grouped and taken as a whole.

The final point that I will compare Clark and Mayer to Norman on is their discussion of the limitations of the human processing system, particularly the memory. Norman feels that it is important not to give humans groups of objects that are outside the limits of the capacity of their short-term memory. He considers the limits of the short-term memory to be five to seven items. Sequences to be memorized (numbers, terms, etc.) not within

these limits are difficult for humans to processing unless groupings can be made to put them within the five to seven item limits. Clark and Mayer also discuss the limits of the short-term memory. They describe it within the cognitive learning theory. The working or short-term memory is between the visual and auditory channels and the long-term memory. Items from the sensory memory must be actively processed in the working memory to be transferred into long-term memory for later retrieval. If connections are not made to aid the process of active processing, it is unlikely the items will be appropriately placed in long-term memory. Errors are more likely to occur in storage or retrieval as a result.

Behavioral Psychology

Use web resources to summarize and cite examples of definitions of these basic concepts from behavioral psychology — positive and negative reinforcement and punishment; shaping; extinction.

Behavioral psychology suggests and defines many terms that are relevant to teaching and learning. In this discussion, I will be summarizing and citing examples of the definitions of the concepts of positive and negative reinforcement, punishment, shaping, and extinction. All four of these terms relate to concept of operant conditioning and are most commonly associated with the research work of B.F. Skinner. Operant conditioning is the modification of behavior brought about by the consequences that follow upon the occurrence of the behavior (web citation 1). So what does this have to do with learning? I will be asking this question and specifically looking at ways these definitions apply in learning environments and can be used by teachers when preparing and delivering instruction.

I will begin with the terms of positive and negative reinforcement. As suggested by the duality of these terms they are related to and are the opposites of one and another. Reinforcement alone is a consequence following a response that attempts to increase the rate of that response occurring in the future (web citation 2). Add positive to the term reinforcement, and it looks to strengthen a behavioral response by providing a positive stimulus to encourage further engagement in that behavior. An example of this related to learning is the receipt of good grades. A student works hard on an assignment and receives an A for a grade thus the student is likely to work at the level on subsequent assignments. Negative reinforcement attempts to increase an avoidance response by adding a negative stimulus. For an example of this in the classroom, a teacher could ensure the good behavior of his or her students by implementing a consequence of no recess if the students engage in disruptive behaviors (web citation 3).

Punishment is similar to negative reinforcement in that it involves negative consequences. The difference between the two is that rather than increase the behavior as a result, punishment attempts to decrease or weaken the behavior. For example, if a teacher were to take away a student's favorite privilege of feeding the class pet as a result of disruptive, loud behavior, the student would as a result be less likely to engage in this type of behavior (web citation 4).

Shaping uses the three forms of reinforcement described above to get someone to engage in a behavior by reinforcing approximations of that behavior. What occurs is a target behavior is selected and then steps or approximations leading to that behavior are broken down to make performance of the behavior simpler and more likely. Each time an approximation of the behavior is completed it is reinforced until it is mastered and then the teacher or trainer moves onto the next approximation until they build to the performance of the complete behavior (web citation 5). In the classroom, shaping can be used to teach difficult behaviors. A teacher can use shaping by beginning instruction with a topic that the students are already familiar with. They can then break the new material

into manageable pieces that are gradually presented until they get to the difficult topic or behavior (web citation 6).

The goal of extinction is get a behavior to stop occurring by removing the stimulus that caused one to engage in that behavior. The once pleasant stimulus that occurred is no longer available making it less likely that the behavior will occur again (web citation 7). Take for example a classroom where a teacher has difficulty controlling the class clown. If she eventually realized that the reinforcement the student was receiving through her and the other students' laughter was the source of these disruptive behaviors, she could work to stop the reinforcement, the laughter. As a result, the class clown would eventually realize that he is no longer making the teacher and his or her classmates laugh as a result of his or her behaviors. More than likely this realization would lead to a cessation of these behaviors.

Summary of Designing Effective Instruction

Summarize the chapters of *Designing Effective Instruction* by Morrison, Ross, and Kemp stressing ideas that you haven't known before or that you don't believe.

Chapter one opens the book with a general introduction to instructional design. I was not aware of some of the criticisms that had been raised regarding the instructional design process. It seems difficult for me to see why someone would consider the instructional design process mechanistic when its primary focus is on the learner. Chapter two goes into greater detail focusing on the need for the instruction that is being designed and states that instructional design process should always begin by determining the training problem. The theme of chapter three is the characteristics of learners and the context in which the learning is taking place. It is difficult not to question the author's assertion that learners learning styles be considered. To do this, what measurement instrument will be used? What research supports the existence of learning styles at all, and if supported, what are the various learning styles to be considered?

Chapter four looks at analyzing the task during the instructional design process, which means the content covered is considered. Chapter five looks at the development of objectives. Objectives describe the terminal behaviors that the learner should be able to accomplish upon completion of the instruction. Chapter six moves to planning the order of the instruction or sequencing. Sequencing is used to determine the best way to organize the material to facilitate learning. Chapter seven is focused on strategies. The prescription for the strategies consists of two components: the presentation to the learner and the strategy to promote active processing of the material. In the past when I studied the instructional design process, this portion was left out. I have never used it before or had it described to me formally. I feel that it is important step especially where it looks to a getting the learner to process information actively.

Chapter eight moves to the instructional message focusing on the presentation of information. It considers how to promote learner engagement through the carefully planned arrangement of content. Chapter nine considers the development of instructional materials. It feels that it is important to keep the materials focused on the instructional problem so that it gets resolved through the instruction. Chapter ten looks at evaluation, which considers the effectiveness of the instruction by measuring whether or not objectives were met. Chapter 11 describes how to develop evaluation instruments. It gives recommendation for the format and design of a variety of instruments to test whether instructional outcomes have been met.

Chapter 12 shifts to formative and summative evaluations. Evaluations should be taking place throughout the process to make sure that the instruction meets its fullest potential. I knew that evaluation was important but had never known that it should take place throughout the instructional design process. After learning this, I realized that this just makes sense especially considering the amount of time and money that is devoted to developing quality instruction. Chapter 13 looks at the role of the instructional designer and describes how they facilitate the design process. Chapter 14 focuses on the

responsibility of the instructional designer to be a project planner and manager. Chapter 15 concludes this text with the implementation of the instruction, which considers the practical aspects of delivering a course.

Chapter 10 of Designing Effective Instruction

Summarize Chapter 10 of Designing Effective Instruction by Morrison, Ross, and Kemp. Be prepared especially to distinguish between relative and absolute standards. Discuss evaluation instruments. Pay special attention to the evaluation of affective objectives.

Evaluation is used to determine if the training designed is meeting its goals. Three types of evaluation will be examined in this discussion: formative, summative, and confirmative. What gets evaluated in this part of the process and how the evaluation is conducted depends on the objectives. The instruments used for evaluation need to be carefully designed to ensure validity and reliability. In evaluations, two types of standards are used to judge achievement: absolute and relative. The final areas considered in this chapter are self-evaluation and the usefulness of pre-testing.

The first type of evaluation to consider is formative. It is used throughout the design process and helps the designer determine if the instruction is continuing to meet its objectives as it is designed. The earlier it is started in the process the better because both time and money will be saved as any errors are corrected before full implementation. It is actually best to take time to complete a formative evaluation at each step of the instructional design process. These evaluations will focus on things like level of learning and performance, appropriate amount time taken to deliver the instruction, the reaction of the learners to the materials and methods used, and whether the measures used assess the learning of objectives are appropriate.

The next type of evaluation that will be examined is summative. Summative evaluation is done at the end of the course to determine if the desired outcomes are met. A measure of this is student performance on posttests and final exams. They should also consider the amount of material mastered against the time taken to master it, the cost of developing the program as well as continuing it, and the reactions to the program along with its benefits. The third and final type of evaluation is confirmative. It is done after the training is complete and has been in place for a while. It considers the need to evaluate and change instruction due to changes that can occur over time. It suggests the need for revisions to or discontinuations of the instruction.

What is evaluated is determined by the objectives and goals of the instruction. There is also a need to use multiple data sources to determine the effectiveness of instruction. All three types of evaluation look at the process and products of the instruction; however, formative evaluation put equal emphasis on both while summative and confirmative look more closely at the products. As would be assumed from when the various evaluations occur, formative looks at testing done throughout the design process while the focus of summative and confirmative evaluations are the final or posttests. The timing of the evaluation is also determined but what is being evaluated. The type of measurement used depends largely on the type of objective that is being measured.

After considering the types of measurement to use, the instruments can then be developed, however, care should be taken to insure that they possess the qualities of

validity and reliability. Validity is accomplished when a test measures what was learned according to the objectives for the topic being tested. There are two types of validity, face and content. Face looks at the face of the assessment measurement. Content validity makes sure all parts of the content are given equal focus and none are stressed too heavily in the evaluation. Reliability relates to the ability of the test to produce the same results whenever it gets used. To insure reliability, develop and use multiple questions on the same objective; standardize the administration of the test; and assure consistent testing conditions, times, and scoring.

Next to be considered is the judgment of achievement through standards. There are two types of standards, relative and absolute. Relative standards are related to the performance of other learners and do not necessarily indicate proficiency in the content area. Grades assigned using relative standards take on the characteristics of a normal distribution. Comparisons from year-to-year of students cannot be made using relative standards as they only indicate how students perform relative to their classmates. Students grouped with many talented classmates may know the materials as well but not score as high as a student for the previous year because of the large concentration of scores on the high end of the distribution in their class versus the previous class with a more normal distribution. Relative standards are used for standardized tests and are useful for determining which individuals stand out in a group and as a result may need special attention (due to either low or high performance).

Absolute standards judge students according to a specific object related standard rather than each other. This type of standard is useful in determining if a satisfactory level of achievement has been met. Other terms used to describe this include: criterion-referenced instruction, competency-based instruction, performance based instruction, and mastery. Absolute standards can prevent grade inflation and insure that a minimal level of knowledge and/or skills is met. They are well suited for self-paced learning.

The final topics to consider are self-evaluation, which allows learners to track their own progress, and pre-testing to determine readiness for instruction. Pre-testing can serve the purposes of assessing preparation and determining what if any concepts have already been mastered. Pre-testing can be used to look at whether or not students met the required prerequisites for learning. If not, appropriate action can then be taken to prevent overwhelming the students and deterring learning. The pre-test can also indicate if improvement has occurred as a result of the instruction by comparing it to the posttest.

Instructional Design Process

Write a paper in which you suggest how the instructional design process in *Designing Effective Instruction* by Morrison, Ross, and Kemp might be applied to something in your teaching. If you are in business, focus on a training issue. Regardless of your current status, be sure that your paper addresses in detail the ways in which you will evaluate (assess) learning. Include specific examples.

Since I am not in a good situation to develop something new to apply this assignment to, I am going to use an instructional design that I developed at UNK using the instructional design process outlined by Dick, Carey, and Carey. I feel that this is more appropriate due to the small size of the organization that I work for and the specialization of our various job functions. The result of this is that choosing a worthwhile training issue to write on would be difficult and in the end would not be very useful to the organization.

The instructional problem that I will be addressing is the development of an electronic portfolio to fulfill a graduation requirement. I will identify the need for this instruction, define the learner and context, complete a task analysis and determine instructional objectives. Then I will sequence the instruction, select strategies, create the message and materials, determine how it will be evaluated, describe the instructional designer's role in the process, and then finally consider plans for implementing the instruction.

I will begin by determining the need for this instruction. In this case, the need is fairly simple, a change in graduation requirements. The need was raised as a result of the renewal of the Teacher Education program for the College of Education at the University of Nebraska at Kearney. When this instruction was designed, this need fell into the category of anticipated or future needs. The authors consider four phases in the needs assessment process. The first phase is to determine what type of needs should have data collected on them. In this case, since it is an anticipated need, data will only be collected in this area. The next part of this phase is to determine the participants in the data collection. For this problem, faculty and students will be the participants. The last step in phase one is to decide how the data will be collected. In this case, e-mail questionnaires and interviews will be used. Next up is collecting the data. The number of interviews and who to interview should be determined. Realistically not all participants can be interviewed so a representative sample of 10 out of the 100 faculty involved and 50 out of 500 students. Then a return rate for the surveys should be set at a reachable number of 80%. The third phase is to analyze the data. This can be used to determine the prioritization of the needs. Finally the fourth phase involves compiling a report describing the results. At this point, the appropriate intervention can be determined and if the problem raised cannot be resolved with instruction, the process should stop at this point.

To be considered next is the analysis of the learners and context. In this step, the characteristics abilities, and experiences of the learners should be considered along with their capabilities, needs, and interests. The characteristics to consider are general identifying variables like gender, age, work and education backgrounds, and ethnicity

along with the prerequisite skills they possess. The other groups of characteristics to consider are academic information and personal and social characteristics. In the case of the learners from the instructional problem that I am addressing, the following information can be used to describe them: 60% female, average age of 20 years, high school education with some college credit obtained, approximately 85% Caucasian, education majors with above average GPAs with ambitions to become teachers, their attitude toward their subject will be that they will need to be motivated because it is a graduation requirement, and no special mechanical ability or training to work under adverse conditions. Prerequisite skills are a little more difficult to determine. It can be assumed that all had training in basic computer skills, but the level of background they will have will vary depending on the high school they attended. To complete this training, all of students will be expected to have the ability to turn on and operate a computer at a basic level, surf the web, and word process. Putting the subject into context will help encourage students to motivate complete this instruction. To orient the context, the students will be reminded that it is a graduation requirement that can help them get a job. The instruction will need to take place in a computer lab during the student's regular class meeting time. The software required to complete this course will need to be installed on all of the machines. Finally to insure that the materials they learn transfer, the instructor will remind they that they can continue to keep up their portfolio to increase their ability to be hired for jobs and that they can use what they learn to create web pages to teach and motivate their students.

For the next step, an analysis of the instructional problem will be conducted. I am the subject matter expert along with being the instructional designer because I am familiar with this topic. To do this the facts and procedures will be broken down into parts that make the instruction manageable and build to a complete understanding of the topic. The facts that will be presented are the definitions that the students will need to know before learning the procedure for creating a portfolio. They will then be presented with the sequence of steps or procedure to complete the task of creating their portfolio. The following is an example of a factual step in the task analysis: define web browsers and web authoring programs. Here is a second example using a procedure: Select Chooser from the Apple Menu by releasing the mouse button when it is highlighted. The reminder steps chosen to complete the task analysis will be manageable so as to not overwhelm the learners.

Next instructional objectives will be written describing what the learner is to accomplish after completing the instruction. In the case of this problem, all of the objectives will fall into the cognitive domain and will go up to the analysis level of Bloom's Taxonomy. Here are two examples of objectives: when requested either orally or in writing to define the word Internet, provide a definition for the word, Internet. Students should provide a one-sentence definition and when requested either orally or in writing to define and differentiate between the words client and server, provide a definition for the words, client and server, and describe how they are different. Students should provide a one-sentence definition of each term and one sentence distinguishing between the two terms. As you can these objectives have two main parts, a description of the outcome of the instruction and the type of performance that indicate the objective has been mastered. The

objectives can be classified like they were during the task analysis as factual and procedural.

Now we will look at sequencing the instruction. Sequencing is important to help the learner best master the material. In the case of this instruction, I will work with learner-related sequencing. I will work with three of the phenomenon described by Posner and Strike; identifiable, difficulty, and familiarity. Difficulty will be based on where the tasks fall in Bloom's Taxonomy. Based on this, I would begin with those at the knowledge level, the simple definitions as background. I would also consider whether or not the students were familiar with the terms and present them with those that they are most likely to know already. I would follow this with the procedures that fall into the analysis level thus are increasingly difficult. Since these are part of a procedure, each step builds on the previous one and therefore can be considered identifiable prerequisites.

The next groups of steps that will be examined are instructional strategies, designing the instructional message, and developing the instruction. The focus of these steps is trying to engage the learner and keep their interest. They also work to connect the instruction to the learner's current and future experiences, therefore, making the instruction meaningful and applicable. Designing the message goes a step further and looks at the presentation of the materials to the learner. Developing the instructional goes even further and considers how to create the materials that will accompany the instruction.

The final step to consider is the most important and should be considered and completed throughout the instructional design process that step is evaluation. Evaluation instruments to determine if instructional objective have been met and are necessary but are developed after the instruction is created. These instruments can be used to complete the summative evaluation, which determines if the instruction is meeting its goals. The formative evaluation takes place throughout the design process. First one-to-one trials will be used that will focus on observation and surveys. Then a small group of learners, which reflect the demographics of the group that the final instruction will be presented to, will be used to determine attitudes and performance. The final evaluation will be conducted with a group the size the actual learning will be presented to. A sample question that will be asked in the one-on-one trials is: was adequate time focused on each of the objective to meet the desired level of competency? For the summative evaluation and an evaluation, the following is an example of a question that could be used:

Which one of these document formats can be opened on the computers in the COE lab?

1. Microsoft Word
2. Word Perfect
3. Microsoft Works

The following evaluation to be conducted is confirmative. It will be used to determine if changes need to be made to the evaluation to improve it or change it over time. In case of this instruction, it was created three years ago and needs to be updated to become current with today's technologies.

Performance Related Feedback

Enumerate as many ways as you can think of through which performance related feedback is given to learners in a course.

The format feedback takes depends largely on the format of the course. Lecture courses provide little feedback other than that of the most traditional form, grades. Faculty teaching lecture style courses can also provide feedback in the form of written comments on materials that are graded. Small discussion courses, however, allow the instructor to provide students with feedback at almost every course meeting through the responses they give to students. Online courses provide the most opportunity for feedback as it takes forms other than just those that the student will be evaluated on.

Grades can be considered the most traditional form of feedback students receive from instructors and are used in all courses especially lectures. Grades given as percentages or letters such as A or C are most common. Grades will give an indication of student performance but little else. Also students tend to focus more heavily on grades than the retention and later application of the material being learned. As a result, grades become a kind of double-edged sword for instructors. Students and administration require that they give them out, but in the end, they are probably the least effective measure of learning.

The next form of feedback that instructors can offer to students is comments. This type of feedback is more useful than grades because it can explain how you can improve or where you went wrong with your answer. They can also be used to tell you what the correct answer is and why. Unfortunately, in large lecture courses, it is difficult for instructors to provide this level of feedback to students. I think at minimum an effort should be made to at least review questions that students had consistent difficulty with on tests. In this way, they would not have to comment on all tests. It was also promote a higher level of learning and more likelihood for later retention than grades alone can provide.

The next level of feedback, which is most likely to be delivered in small discussion format courses, is verbal comments on answers. In these types of courses, students and instructors engage in conversations about the topic being taught. Students receive immediate feedback from both the instructor and other students. This lets students know if their level of understanding of the material is on track long before the tests and then final grades. It is also more like the feedback students will get in the real world from their boss, for example, when they are employed. The danger of discussions is that they can easily veer from the topic at hand. This is where the instructor role of steering the conversation is extremely important. This can also be a good thing as it may allow students to consider the topic in a different way and increases that likelihood that it will be connected to their experiences, and therefore, learned and retained.

I feel that online course provide the most opportunities for feedback as they involve not only grades and discussions but can also include immediate feedback configured within the computer. This type of feedback can take the form a tutor or electronic learning

assistant; help documentation; or questions with comments on the answers provided immediately after the question is asked. Questions can also be modified and designed at a level of difficulty that adjusted with the students' level of understanding. I feel that this form of feedback has the most potential for increasing learning. It is immediate and adjusts for individual learners.

Using Research to Design Instructional Messages

Summarize one principle you have learned in this course that you did not know before starting the course. Provide at least 2 URLs demonstrate your ability to use research results in designing instructional messages. At least one URL must be dated later than 1998. A least one reference must contain numerical data.

I have learned several things from this course that I did not know before I started it. I think the most important message that I can take from it, however, is to design instructional materials that are simple and learner focused. In the discussion of the ICML, we learned to take a learner focused approach to improving individual student's learning by developing the ICML components. Norman focused on the simplicity of design suggesting creating items whose use can be inferred. Clark and Mayer provided recommendations for enhancing instruction by not overwhelming the learner. MRK caused me to consider the importance of designing learner-centered materials by considering my audience. The articles for this week were focused on feedback, which requires that you considering the most appropriate form of feedback for your learner. I will begin this discussion by looking at these five topics we have addressed in this course in depth. Then I will examine two URLs with instructional materials I have created and consider how and whether they meet the criteria put forth by these authors. I finally will suggest improvements to these materials based on what I have learned in this course and spoken about in this paper.

The ICML promotes learner-focused instruction. It suggested that student abilities to learn could be improved through the instruction that leads to the further development of this model. Doing this would require very individualized instruction that determines what areas of the model need improvement in a particular student and how to go about improving them. It is difficult to determine what areas of the ICML a student needs to improve upon with working with them one-on-one. As a result of this, it is difficult to develop the various components of the ICML in an online environment. Probably this component of the ICML that lends itself to the most improvement in online instruction is strategies and metacognition. The reason for this is that this area can be taught based on the subject matter as well as the student's individual ability. What I took from this was that suggested strategies for retaining and learning the material could be presented hand in hand. We will move next from focusing on learners to simple designs.

Norman advocated simple designs. He believes that if an item is designed; and instructions for using it have to be placed on it, it should be redone. He also suggests that designs should provide some form of feedback to indicate that they work. Without feedback, the design becomes difficult to understand because the user is forced to try to figure out on his or her own if the actions he or she took on the object were successful. He also suggested that related items on an object should be placed together so that a map can be made in the user's mind indicating their relationship. This can be applied in instruction as well be putting related content together within instructional materials. The final idea that I will consider that Norman related to simplicity was the limitations of human memory. He feels that care should be taken not to overwhelm the user of an

objects memory by not presenting more than five to nine items to it. As long as a designer keeps within these limits, he or she can avoid overwhelming a user of his or her materials. One way to avoid this is by grouping items together much like was described in mapping.

Clark and Mayer's recommendations were mainly focused on multimedia. They also place careful consideration on not overwhelming the user of instructional materials. They suggest that this can be accomplished by not using extraneous materials and by targeting information at both the user's audio and visual channels. They also say that the information presented to each channel should be focused and unique to avoid overwhelming the channels. They also encourage grouping items that are related close together so that the relationship is obvious. Tabber et al. (2004) found results consistent with this suggestions as adding cues to the diagram also reached statistical significance, $F(1, 107) = 4.02, p < .05$, with a higher score for the cued conditions ($M = 32.0, SD = 5.3$) than for the no-cues conditions ($M = 30.3, SD = 5.4$). They think that extra materials that serve no purpose other than to entertain the user should be left out because they are distracting and make it more difficult for the user to determine what to focus their attention on.

Knowing your learners is an important part of determining what to focus their attention on and how to focus it. MRK feel that targeting your instruction towards your intended audience is extremely important. They devote an entire step in the instructional design process to selecting and analyzing your learner. They even suggest doing preliminary evaluations of your learners through surveys and observational investigations. They suggest this so that you can determine learner entry behaviors. Doing this will prevent providing them with information they already know or leaving out information they need to know to complete the task your teaching. This process can also help you with motivating and teaching your learners as you can determine content they already know and use it to provide a context for learning the subject. They also place emphasis on considering your learner throughout the design process. Focusing all step of the design process on the learner will lead to better instruction that the learner is more likely to be able to apply and use in the future.

The last theme that has been considered in this course that I will discuss here is feedback. The authors that we read suggest that feedback is an important part of the instructional process and that it should be developed to target your learner's needs. Feedback that does not consider the learner's ultimate purpose for receiving the instruction will be ineffective and will not necessarily promote learning. Say, for example, that the learner receives a grade as feedback for a behavior that is to be preformed at work. What is the likelihood that they will be able to continue this behavior in the appropriate environment? It probably is not likely since the feedback was inappropriate. Comments or performance evaluation from the employee's supervisor would have been more appropriate in these cases.

I will move now to instruction that I have designed and applying the principles that I have learned to it. The first URL I will review is located at:

<http://wagonerstudios.com/portfolio/multimedia/1.html>. This is a project that I created with Flash in December of 2001 on the Bermuda Triangle Mystery intended for fourth and fifth graders. I do not feel that I took advantage of the suggestion to attempt to improve ICML components through instruction. I could have accomplish this by attempting to teach a strategy for learning latitude and longitude such as longitude is long and skinny like a tall, slender person. I feel that it minimally follows Norman's guidelines for simplicity because, although it does provide directions, the user does not necessarily need to refer to them to complete the tasks required. It also considers Clark and Mayer recommendations in that it does not use extraneous materials and places related items together. One thing it could do is to put the instructions in an audio format to avoid overwhelming the visual channel. This instruction considers the learners from the standpoint that it is appropriate for the age level it was made for given that it uses interactivity and was designed to use only the entry behaviors that the users would have. Finally, the feedback provided is appropriate because it is immediate and appropriate to the material being covered.

I will now look at a second set of instructional materials that I have designed it terms of what I have learned in this course thus far. The website I will now consider is located at <http://wagonerstudios.com/portfolio/coursework/pte884/>. It teaches students to create web-based lesson using Dreamweaver. This lesson does consider the ICML well because it suggests strategies for using web lessons in the classroom and using search engines effectively. Students can draw on these strategies when they develop web lessons for their own classrooms. I do not feel it is simple in accordance with Norman because it gives the user far to many choices. Selections could have been grouped better or links could have been placed on separate pages to break-up the list of steps on the index page. Again it could have used audio to better address the suggestions of Clark and Mayer. It also fails to meet their suggestion because it uses materials that are extraneous in the form of images that are not necessary to teach the material. It probably could also consider the learners better as it starts assuming that they have a better low level of knowledge on the use of computers. Since the group targeted by this instruction is college students, it can be assumed that they were taught some of the items also covered in this course in high school if they did not learn these topics on their own. Finally, the feedback provided by this lesson could be improved. The only real feedback that is provided by it is received as a result of clicking on links and does not lead to learning. The most effective way students could determine the effectiveness of the web lessons that had designed was to use them in the classroom and then survey student enjoyment or evaluate student learning. With this, they could see their web lessons at work and would be motivated to try to use them in their own classrooms because of the power of the students' responses to the lessons.

Tabbers, H. K., Martens, R.L., & van Merriboer, J. G. (2004). Multimedia instructions and cognitive load theory: Effects of modality and cueing. *British Journal of Educational Psychology*, 74 (1), 71-81.

Keller/PSI Course Strategies

Summarize the strategy used in Keller/PSI courses. Summarize the RESULTS from using this strategy. Suggest reasons why this strategy may have been abandoned.

This paper will consider the Keller Plan in detail. It will look at the strategy used to teach PSI courses. The results obtained from using this strategy will be examined, and then reasons why this strategy may have been abandoned will be determined. It will look at the studies have been done on this plan.

The strategy used in Keller/PSI courses is based on mastery learning. It is highly effective because it uses tutors extensively providing student with the level of feedback and challenge necessary to achieve this level of learning. What makes this approach unique is that it is designed so that it will be effective in large, lecture classes.

Traditionally providing students with the level of feedback necessary to accomplish this level of learning in large classes is difficult. However, in these courses, students work at their own pace and tutors provide feedback on evaluations and assignments. Students must demonstrate mastery on each unit before they can proceed to the next. The level of mastery is set as a pre-determined score on a test or quiz. Because students learn at their own speed and have differing abilities, some students achieve mastery more quickly than others and as a result move at a faster pace. Self-pacing allows this format to works for the instructor and students. Traditional lectures courses do not allow this as students work at the instructor's pace. Some students get left behind while others get bored in this format, which is partially what made some consider the Keller Plan superior to more traditional teaching strategies. Tutors are selected from the class being taught by the Keller Plan, and the selection is based on their knowledge of the subject matter and their ability to interact well with others. They are assigned to work with a manageable number of their classmates providing individualized instruction and reinforcement. Putting a course in this format requires a good deal of up front planning on the part of the instructor as they must determine the break down of the units in advance and provide students with a detailed outline of how to proceed through the course. Modules are not that limited in the format they can take even though they do not involve lecturing. They can include things like reading, films, listening to audio, field trips, experimentation, interviews, and so on. The only real limitation placed on them is that they have to allow students to work at their own pace. Evaluations can also take a variety of forms from essays to multiple-choice questions to written reports or speeches.

The results from using this teaching strategy are generally positive, however, some authors have skewed the results of studies of the Keller Plan. It is difficult to tell why they do this, but it maybe the result of some of the frustrations that result from teaching using this strategy. The Keller Plan seems to be most effective with weaker students. It increases student's motivation and attitudes towards the course. One aspect that it fails on is according to research is completion rates for college courses when they are self-paced. The authors of the articles we read recommend that deadlines be set to help keep students on track and to increase these rates. In research done studying the Keller Plan, it is important to consider how the articles that are reviewed were selected. It is also important that the measures used in the studies be comparable or be adjusted so that they can be compared.

I think that the reason that the Keller Plan is not widely used anymore is well described by Silberman. He stresses that the plan is not very reactive to the feedback of students and is difficult to modify. His main concern with it is the amount of work that it takes up front to design and that once developed it cannot be changed. The difficulty of changing the instructor based on the Keller Plan comes as a result from the student's negative responses to attempting to do so. They have no desire to deviate from the instructor original outline even if it means they may learn more. Silberman also misses learning from the students as a result of teaching a course. He feels that this highly lacking in this teaching strategy and states that teaching like this leads to instructor burn out. In fact, he recommends rotating the faculty teaching using the Keller Plan so that its use can be continued. His was also considered that this format allows students the opportunity to cheat on evaluations or not fully learn the material because of the format of the evaluations. This is also a major weakness of the plan and difficult to combat. This paper has considered the Keller Plan and the research done on it. The teaching strategy used for PSI courses was looked at. Teaching with this strategy gets results depending on the circumstances of its use. The main reason for its abandonment results from the difficulty in setting up the course and the inflexibility of teaching courses in this form.

Keller/PSI Learning Experience

IF you have had experience with such a course, summarize your experience. How does/did it fit with the research and commentary read for this course target?

I had experience with learning through a modified form of the Keller Plan at KU. I actually took a course George Semb, an author cited in the throughout the references of the third article we read. He approached the course by breaking it into two parts. Part of it followed a traditional lecture-based approach and did not use the Keller Plan at all. However, the remainder of it, which he described as the evaluations and lab, used the Keller Plan extensively. We were evaluated through computer-based quizzes and required to achieve a certain score before we could move onto the next quiz. We could take the quizzes as many times as we wanted. The evaluations seemed to be randomized and drawn from a pool of questions, which were sometimes repeated. The book that we used was written by the instructor, which gave him a great deal of control over the units and the structure of the course. I have a hard time imagining what the course would have been like had the instructor used someone else's material. The course materials also included a workbook, which we were to complete before taking the quizzes. After we completed the workbook, a graduate student evaluated it providing feedback and serving as our tutor for the course. This is another modification he made to the use the Keller Plan as the tutors were graduate students rather than classmates of those taking the course. I did not feel that this interfered with the quality of the course or his use of the Keller Plan because they were similar in age and experience to us. They also likely had more advanced knowledge of the subject than our classmates may have had. When I took this course, I remember taking the quizzes until I achieved not just the required score but a perfect score. I enjoyed taking the course at my own pace and remember finishing it well in advance of the deadline. It was nice to be done with one of my courses long before finals took place. The instructor did set deadlines for when we had to complete units of instruction, and we had specified lab times during which we were supposed to use to take our quizzes and work with the graduate students/tutors. Part of the reason I finished my work early was to avoid the congestion in the lab when so many students were trying to finish a unit on time. This was a big problem because there were a limited number of computers available. These deadlines were also taxing for the graduate students evaluating us, as they would be overwhelmed with lines of students waiting for feedback.

Technology and Learning

Compare the four papers: identify the similarities; identify the differences.

Of all the topics we have explored so far, this one has sparked the most interest for me. It is interesting to consider why computer media may enhance or inhibit learning especially when the general assumption when it first came out was that it would always boost learning. I am curious that if as computers become increasingly ubiquitous and mainstream potentially some of the effects found in these meta-analyses will not continue. Most of the studies in the articles we read were done early after the adaptations and use of computer media in the classroom began especially those involving the web and hypermedia.

I also questioned whether the differences obtained between the traditional and multimedia groups are a result of the medium used or if it is due to differences in the message delivered. The studies described in these articles typically (but not always) used different instructional materials for the multimedia and traditional groups. Does this not make the comparisons between the two groups one of apple to oranges rather than apples to apples? Several authors have expressed a great point. Is the difference in effect due to feedback differences? Computers are more capable of providing consistent feedback whereas accomplishing this is impossible for classroom instructors. Could feedback be the difference between multimedia instruction and traditional instruction? We have learned from previous readings that feedback has a powerful effect on learning. Additional follow-up research in this area should examine this if it has not already. I am curious about the differences found within subject areas and the biasing effect that results due to the quality of feedback computers can provide. To me continued research in this area could take a variety of directions and I would like to review the literature to see if any of the questions I have had have been explored.

I would like to see a measure of novelty and computer familiarity introduced and measured as well as controlled for the sake of comparison. Especially now that most members of today's younger generations (those currently in college and all younger individuals) have been exposed to desktop computers their entire lives. To me, this would help determine if these are the reason for the increased effect sizes for the computer media groups. I find it interesting that none of these studies controlled for this variable but I guess at the time they were completed computer-based instruction was unfamiliar and novel to most everyone.

Next I would like to look in further depth at the reasons for the differences in effect size found in different subject areas. I am especially interested in the differences found between traditional and computer instruction in the areas of reading and math. I think that the reasoning behind these differences may be the result of feedback. It is easier to provide feedback for a math problem on a computer than it is for reading where I feel in-person feedback is more appropriate and adaptable to student needs. Computers are known for being number crunchers and we have yet to teach them the intricacies of human communication and language. As this improves, I think that we will see a shift in

a computer's ability to teach students reading. Until then, the feedback provided in-person by a teacher would likely continue to remain superior. I would like to try to adapt and improve computer feedback to emulate in-person feedback for reading. I think feedback is a topic worthy of even more investigation than I have described thus far and would like to see it be controlled for so that its effect can be eliminated a potential confounding variable.

The articles proposed a variety of reasons for why multimedia learning was able to produce higher effect sizes than traditional instruction. One that was discussed in the third article was that learning subjects or with materials that require search the result obtained is likely to be improved with media. The authors theorized that this was partially a result of media's capacity to improve a learner's ability to compare and synthesize information. Related to this discussion was media's ability to organize instruction better and therefore increase learning outcomes.

The fourth article we read by Kulik found similar results that compare with the first three in the area of math instruction especially. It found that the use of multimedia in math instruction increases learning levels. The level of results found that the effect sizes were around the level of 0.5. However, the range found was quite large but was still reassuring because it usually translated to a percentile jump around 10 percentage points. He also reviewed studies in the area of science that produced similar results as math.

Ericsson's View of Practice

First, of the data provided, identify the part of the Ericsson study that most surprised you; what did you least expect? Think either of your professional life as a teacher in the context of the students you prepare, or your own professional life. Identify the effort you now think it will take to achieve expertise in that context.

In this paper, I will be examining Ericsson's article regarding practice and what he believes it takes to become an expert in a particular domain. I will begin by identifying the area of his study that surprised me most and that I did not expect. I will then consider this in the context of preparing students and my own preparation in my field. I will consider the impact of what I have learned will have on my teaching, and my own learning and practice.

I was most surprised by the results found in the Ericsson study that seemed to indicate that innate ability has very little over effect on an expert's ability to perform a task. I have always believed that there was a genetic component to a degree in the backgrounds of all experts. It appears that even if this is the case the biggest impact on overall expertise comes as a result of encouragement and practice. I even felt that he would argue that an individual could become an expert without any innate ability so long as they practice, receive support, and are motivated to increase their knowledge in that area. To me, this goes back to the nature versus nurture argument to a degree. I had always landed somewhere in the middle of this debate believing that both nature and nurture have an almost equal impact on an individual's abilities. However, it would appear that Ericsson would be on the side of nurture almost entirely with a little bit of influence from nature. This leads me to question what would happen if someone without talent were told that they had talent in an area at a young age? Would they eventually be able to achieve expertise through practice? I think that to truly support the conclusions drawn in this study an experiment of this nature should be developed and attempted. If individuals with no talent or innate ability could become experts entirely as a result of practice, then one could argue that there is no influence from genetics or nurture.

These conclusions should lead teachers to consider and attempt to practice several things with their students. First, this study indicates the extreme importance of supporting and encouraging students as well as giving them an indication of where their strongest talents lie. It indicates to me that the younger the students receive this type of feedback the better. Most importantly it stresses the importance of practice to learn and specifically become an expert in a particular area. This to me is indication that even if expert level of achievement are not necessarily the desired outcome practice is still an important component of learning to do something well. I think it even encourages the teacher to point out student's talents to their parents who can foster them more readily as they are involved in their children's lives for more than just a year. I would also say that if a teacher does not feel that the parents can or will provide the support needed to develop their child's talent then they should connect them with a strong adult mentor that can.

As I read this article, I began to think of my own areas of talent and expertise so that I could consider how I was able to develop them. I would say that I have two areas that I was talented in as a child one that was fostered and one that was not. Then from there I would say that the talent I practiced is one that I became an expert in and I also developed in an expertise in area that one cannot really have perceived talent in. I did, however, practice this knowledge and that is what led to me becoming an expert.

My expertise that began as a talent that was then fostered by parents and teachers as result leading me to practice my skills in this area was my use of computers. My parents purchased a computer when I was in second grade and when they realized that I was talented at using it they purchased additional software and books to help me learn more about it. They made sure I had the opportunity use computers and to take computer classes in schools at a time when this was not quite to the point that it was commonly available. They also continued to purchase additional computers as upgrades became available. I am to the point know where I have been using computers for almost 20 years and since that is beyond 10 I would say I am well on my way to achieving expertise in this subject.

The talent that I have that was not developed through practice was my artistic abilities. I still have and use them but have not received much training. I feel that I have talent here still because I am able to design things and combine colors more quickly and with more skill than average so much so that I am able to use these skills at work. I am curious what would happen to my perceived talent with practice, support, and training at my age. I fear that it might be too late for this to help because of time limitations and the like.

Finally the area that I feel that I am expert in but did not have talent in mainly because I would not what constitutes talent is raising rabbits. I started in rabbits when I was in ten or in fourth grade. My mom was very supportive of this hobby and made sure that I had the support and resources I need to learn about them. I became motivated to learn more about them as a result and began practicing showmanship and started to build my rabbit herd. My practice in showmanship led to one third, one second, and six first place awards at the county fair. Finally I would feel that my skill level was demonstrated fully when I was select as the grand-champion in the state of Iowa my senior year of high school. Winning these awards helped reinforce to me that I was good with rabbits and has led me to what to further my skills through continued practice so that I can obtain my judging license.

I have looked at Ericsson's article regarding the practice it takes to become an expert. I started by choosing his view that was most unexpected to me breaking it down and examining it in depth. Next I looked at the impact this article should have on teachers in their classrooms and gave what I felt would be Ericsson's recommendations to help their student's become experts. I then consider the areas that I feel I am an expert in and how I have been able to become an expert. I also looked at what it would take for me to continue to develop my skills in these domains.

Cognitive Load Theory

Summarize the principal features of cognitive load theory as developed by Sweller and as expressed in the overview article by Cooper.

The cognitive load theory is based on a variety of principle features. The first that he discusses regards the three modes of memory: sensory memory, working memory, and long-term memory. Each of these three modes has different limitations and as a result has their own functions within the human information-processing model. Sensory memory takes in information from our senses and has a very short duration. Long-term memory is made up of the knowledge and skills that we hold permanently and has a seemingly unlimited capacity. On the other had, working memory has a limited capacity of five to nine items.

Learning is the next feature that Cooper discusses. We need learn information to transfer it into long-term memory. Essential to the process of learning is that information be attended to by working memory. If something interferes with this processing, information will not be transferred to long-term memory and remembered. Through extensive learning in a particular subject an individual can become an expert in the subject matter. There are two features that distinguish experts from other individuals. They have expansive schemas regarding the subject in their long-term memory and have a high level of automation related to tasks performed in their subject of expertise.

The definition of cognitive load will be considered next. It is the amount of mental activity required by working memory at a particular point of time. Contributing to cognitive load is the number of elements that working memory must attend to at once. In cases of these situations, context is important and as is element interactivity. Element interactivity is considered the degree that elements can be understood in isolation. The more interaction between the elements to be learned the larger the cognitive load placed on the learner. The size of the elements depends on the complexity of the schemas held by the learner. An expert has more complex schemas, and therefore, is able to group information together into larger elements. There are two types of cognitive load, intrinsic and extraneous. The intrinsic cognitive load is due to the difficulty of the content and cannot be decreased through the instructional design. Extraneous cognitive load is due to the materials used to teach students and can be improved through instructional design by creating the appropriate combination of text and graphics.

In conclusion, we will look at the effects generated by the cognitive load theory. The goals are to both benefit learning and to create a measurable effect. To best generate effects one should obtain students whose expertise to difficulty has room for manipulation.

There are six means that designers can use to create effects including: goal free effect, worked example effect, problem completion effect, split attention effect, redundancy effect, and modality effect. The goal free effect redefines the goal so that there is not one.

Worked examples show the step-by-step procedures needed to solve problems. The problem completion effect shows a partially worked problem and the learner completes it. The redundancy effect requires presenting only the information that is necessary whether in the form of a graphic or text but not both if not necessary as working memory will be overwhelmed. The modality effect works to overcome the fixed limits of working memory by presenting the information to multiple senses at the same time.

Thus generating a goal free problem and mimicking methods experts use to solve problems. The information they contain equates to both schemas and automation. The split attention effect occurs when a learner needs to attend to multiple sources of information or multiple activities. If materials can be designed to eliminate split attention then learning will be facilitate learning. If the information is presented to both the auditory and visual channels, the amount of information taken into working memory can be increased beyond the known limits.

Motivation

Write a critique of the Brooks/Sheel paper on motivation

My first impression of the Brooks/Sheel paper was that it synthesized what we learned in this course on cognition and learning. It also added some research and viewpoints on memory and learning that we had not focused on heavily in the course. Not only that, it gave me some perspective on why we had not considered in depth the work of these authors. It was amazing to me that the authors were able to reduce the work of two psychologists, Vygotsky and Piaget, down to two paragraphs. It is not necessarily that I do not agree that Piaget's work could be accounted for in terms of increasing chunk sizes and Vygotsky's in feedback. My concern would be the reactions of others especially those in the fields of human development and psychology that place a lot of stock in these ideas and the work of these individuals. I think that it is good that the primary intended audience for this work is chemistry teachers rather than those in the social sciences that I mention above. My basis for this is that I think that they would miss some of the better ideas asserted in this article because they would stop reading or lose respect for the authors after seeing their life's academic work reduced to level of simplicity.

Of course, there are some authors that would simply look at these views as a challenge to be refuted through either the past numerical data they have collected or future studies that they design. This is one of the perks as well as one of the dangers of working in academia. It is too bad that neither Vygotsky nor Piaget is around to defend his work anymore, as I would be curious how they would react to this paper. I cannot nor will try to argue on their behalf but will attempt to on my own as the research that I did as an undergraduate was based heavily on Vygotsky's work on social cognition. I do still feel that there is value in the social memory work that I did as an undergraduate and was the basis for my first published work. I do not know how in depth you have gone with the article that I sent you that is eventually to appear in the Journal of Cognitive Development but will summarize it and explain why I feel that this paper does not fully explain some of the conclusions we found. We explored the relationship between kindergartners' prior socialization, their impressions of a fictional character, and their memories for that character's behaviors and found that there was an indirect relationship between prior socialization and memories for the character's behaviors.

So what? The more I thought about it the more I realized that a lot of our work could be explained in terms of feedback. Pretty much all of the knowledge that the children seemed to have and used to describe the characters was a result of previous feedback they had received and behaviors that were reinforced in social situations (kid's forming positive impressions of the character likely received feedback that influenced them to become good kids and have more knowledge, larger chunks, about behaving in socially acceptable ways and vice versa for the 'bad kids'). I still feel that socialization has a place in terms of learning and expertise. Who determines what is socially acceptable and what we choose to attend to and eventually learn? What effect do labels have on eventual student outcomes like being called gifted versus developmentally disabled, and why do

we not more closely examine the effect of our using them? What would happen if the social context that we were suddenly changed? If either of us were raised in an African tribe whose livelihood was based heavily on hunting or gathering, our choice of subject to focus on and motivations towards them would probably be very different. But I guess choice of subject is partially based on the feedback from either the environment or society. I also wondered how learners compensate for "holes" in their memory? Is it unreasonable to say they try to adapt their knowledge to fill especially if feedback is absent?

In terms of other items that stood out to me in this article, there were a few more things that got me thinking. I found it curious that element interactivity and schemas were not discussed with chunking. I think that the terms are related but not interchangeable at least not in terms of the definitions provided by Sweller. I do not think that they needed to be included necessarily but find that their roles in the information processing system are both important and interesting.

The last things that I considered were several questions raised in my mind regarding motivation as a result of reading this article. Can motivation be increased through practice? Where does it come from and why is someone more motivated to complete some tasks than others? What about motivation from external sources encouragement, positive feedback? How does one measure motivation? This article would be strengthened if a means for measuring could be described in terms of the definition given for it here. I think that the definition used for motivation in this article might generate some confusion. Not so much because I think that is inaccurate but because it is unique and very different from the traditional terms that it is thought of in. It might be safer to create a new term to refer to motivation as it is described in this article.