ABSTRACT OF CAPSTONE

Michael A. Rutherford

The Graduate School

Morehead State University

March 26, 2013

THE ARTISAN TEACHER: A FIELD GUIDE TO SKILLFUL TEACHING

Abstract of capstone

A capstone submitted in partial fulfillment of the
Requirements for the degree of Doctor of Education in the
College of Education
At Morehead State University

By
Michael A. Rutherford

Waxhaw, North Carolina

Committee Chair: Dr. David Barnett, Professor

Morehead, KY

March 26, 2013

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THE ARTISAN TEACHER: A FIELD GUIDE TO SKILLFUL TEACHING

When teachers, and those who support and develop teachers, share a common, professional lexicon of effective practices, instructional improvement can occur in a more effective and efficient manner. The aim of this capstone project, *The Artisan Teacher: A Field Guide to Skillful Teaching*, is to create such a lexicon, and publish it in a user-friendly and growth-evoking format. The *Artisan Teacher Field Guide* identifies twenty-three themes or patterns of effective instructional practice and describes the utility of each theme in a consistent, easy to navigate manner.
KEYWORDS: Artisan, Theme, Field Guide, Lexicon, Observation

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Dedication

I dedicate this capstone project to the memory of my father, Claude H. Rutherford, whose life illustrated the transformational power of education and diligence. He was, and is, my first and best teacher.

ACKNOWLEDGEMENTS

This work would not have been possible but for the thousands of teachers who graciously opened their classroom doors for observation of their considerable talents and skills. From these observations Pam Edwards compiled many of the classroom examples and additional research for inclusion in the appendices. Suzanne Ward kept Rutherford Learning Group, Inc. on task and on schedule while I took time off to write. Many thanks to Morehead State University, the talented members of my cohort, my supportive and knowledgeable committee, Dr. Carol Christian, Dr. Ann Kilcher, and chair, Dr. David Barnett. Finally, I'd like to thank three teachers who read much of this work and provided valuable feedback on whether what I was writing was clear and applicable for the teachers and administrators who might read it - my wife, Danette Rutherford, and our two teacher-daughters Allison and Emily Rutherford.

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Executive Summary

An important hallmark of a profession, as opposed to an occupation, is that professionals practice based on an established body of knowledge for the benefit of clients. Physicians practice according to an established medical body of knowledge for the benefit of patients. Attorneys practice according to an established body of legal knowledge on behalf of clients. Airline pilots practice according to an established body of aviation knowledge on behalf of passengers. And educators, if we claim to be professionals too, should practice according to an established body of educational knowledge on behalf of our students.

A consistent element of all professional practice, then, is the basing of professional practice on an established body of professional knowledge. Evidence of this is found in the use of a common lexicon of professional knowledge. Medical Doctors speak and collaborate using terms from a common, scientific lexicon known and spoken by all physicians. Attorneys and airline pilots do the same thing. When this common, scientific lexicon is used, collaboration is clearer, faster, and less prone to error.

I was visiting a friend in the hospital one evening and stepped onto an elevator with two physicians who were talking about a patient. As they spoke, I felt a bit uneasy since I knew I should not be privy to the patient's medical condition. Then I realized that I had yet to understand a single word they said. The patient's privacy was safe. Why? The physicians were using their shared scientific language, a language I didn't understand. I also noticed that, even though the elevator trip was short, the physicians seemed to accomplish a good deal of collaboration. These are the fruits of a common lexicon; speed of communication, clarity of meaning, and fewer errors due to misconception or misunderstanding.

The common lexicon is an important element for educators' professional development too. As I work with teachers and those who seek to develop teachers, I often find that the lack of a common professional language weakens the link between new learning and its application in the field. Joyce and Showers (2002) were among the first to detail the lack of transfer between new information acquired in a workshop setting and the actual application of that information in the field. Their studies pointed to, among other factors, the need for practice of a new teaching skill with feedback from a trusted, knowledgeable observer. Sparks and Hirsh (1997) emphasized the importance of practice with feedback and coaching as two processes that increase the application of professional development.

A common lexicon enhances educators' abilities to see patterns of effectiveness rather than only individual instances of effectiveness (Bransford, Brown, & Cocking, 2000). Pattern recognition is enhanced when the patterns have commonly understood names and characteristics. In a study where expert and novice physics teachers were shown video of a physics lesson and then asked to verbally describe the approach, the expert teachers identified larger patterns of instruction by name while the novices spoke of smaller, discrete teacher actions (Larkin, Mcdermott, Simon, & Simon, 1980). Over-contextualization, seeing something as a unique element of a specific context, rather than as one example of a larger pattern, has been identified as a key constraint for transfer of new learning (Bjork & Richardson-Klavhen, 1989). A common lexicon can reduce over-contextualization in that it supports identification of patterns of effective instructional practice, rather than isolated, individual instances.

These illustrations further describe the link between expertise and pattern recognition:

- An experienced meteorologist looks at cloud formations and identifies patterns that support tomorrow's weather forecast. A novice simply sees shapes in the clouds like cotton balls or ocean waves.
- An expert financial analyst sees patterns in long streams of numbers from corporate quarterly reports. A novice simply sees numbers in small print.
- An experienced woodsman sees game trails and signs of wildlife in the forest. A novice simply sees leaves and dirt.
- A chess master sees individual moves as parts of an overall approach or attack/defense strategy. These series of moves can number in the hundreds. A novice chess player sees moves as discreet actions or perhaps as small groups of two or three moves that act in concert.
- An experienced school administrator identifies movements in the crowd at a high school football game that suggest possible conflict. A novice observer of the same movements simply sees lots of people moving about.
- An expert classroom observer notices the immediacy and specificity of teacher feedback to students and the resultant increase in student effort

and persistence. A novice observer simply sees the teacher circulating around the classroom and speaking with individual students.

The lack of a commonly used, professional lexicon and the resulting over-contextualization, lack of reflection, and decreased application of new instructional practices is likely due to a number of interrelated causes.

1. Different titles are often used to describe similar practices. Since these titles often arise from a particular approach to instruction there is some tendency to brand name certain techniques. When two brands describe a common technique there is no incentive (in fact there is a disincentive) to clarify the conflict. A T-chart or a Venn diagram might be referred to as a *non-linguistic organizer* or as an *image-text mental model* depending on which author is being read or which professional development program is being implemented.
2. Sometimes a common term is used to describe very different instructional ideas. For instance, in *A Framework for Understanding Poverty* (Payne, 1995) the term mental models is used to describe a sort of paradigm that is shared among children of poverty. In *The Fifth Discipline Field Book* (Senge, Kleiner, Roberts, Ross, & Smith, 1994) mental models is a term used to describe archetypical patterns of thinking that members of a learning group may share. In *The Artisan Teacher* (Rutherford, Forthcoming), mental models refers to structures that teachers might use

to organize students initial understanding of a concept. In these instances the same term is used to convey three separate meanings.

3. In novice teaching, which may endure well into a career, it is common to think in terms of strategies, rather than to see how strategies fall into larger patterns. A lack of terminology for these patterns can increase this over-contextualization.

The dilemma of poor pattern recognition persists in classrooms, schools, and districts due to a number of common factors. Time is scarce. And, it takes time, both teachers' and administrators,' to observe instruction or reflect upon it and apply a common lexicon of patterns. More time is spent on pattern identification in pre-service activities than in-service professional evelopment. Since pre-service learning is, by definition, prior to teaching, pattern identification can be seen by teachers as mostly theoretical, rather than practical.

Administrators have dual roles as developers and evaluators of teachers' work. Administrators' attempts at pattern identification can, from the teacher's perspective, seem judgmental and critical, rather than helpful and developmental. In many instances, unfortunately, administrators are simply not seen as credible instructional leaders by their faculties and their attempts at teacher development are, therefore, resisted.

What is the core of the capstone?

The Artisan Teacher: A Field Guide to Skillful Teaching is a writing and publishing project. The goal of the project is to identify a set of terms that describe common patterns of skillful teaching, organize those terms into a user-friendly, easy to navigate publication that can be used by teachers and those who support and develop teachers to increase teaching quality.

This capstone project focuses on the identification of the common patterns of skillfull teaching, the naming of them, and the describing of the themes in a manner akin to how a field guide might describe a particular set of birds, insects, or flowers. The descriptions of the themes are meant to be cogent and scholarly, as one might expect from a field guide, but also interesting and personalized, as one might expect from a travel journal written as a personal narrative by a single traveler. It is hoped that this hybrid approach (field guide + personal narrative) will make the contents more accessable and valuable to the teachers and and administrators who might use the work.

The publication format for the work, including graphic design, page layout, illustration, and other publication formatting, will also be important as factors in usability. This capstone project, however, is limited to the development and writing of the content, and does not include the graphic design, page layouts, or other eventual publication formatting decisions.

Who is the capstone meant to impact?

The Artisan Teacher: A Field Guide to Skillful Teaching is intended to support the development of teachers and teaching in pre-K-12 public, private, and charter schools. In order to fulfill that purpose, the *Field Guide* is intended to be used primarily by two groups. First, the *Field Guide* is intended for teachers as a resource for their own reflective practice, collaboration, and professional development. Second, the *Field Guide* is intended to be used by school administrators, instructional coaches, and/or anyone who plays a role in the development of teachers and teaching. These teacher developers will use the *Field Guide* as a resource for observing and identifying skillful teaching and for providing teachers with growth-evoking feedback and coaching.

How was the capstone implemented?

The development of the *Artisan Teacher Field Guide* can be thought of as having three major components; the identification of the lexicon of terms that describe recurring themes of effective classroom practice, the writing of a narrative element for each theme, and the assembling of a set of classroom examples that illustrate each theme.

The first component, the identification of the lexicon of terms, is complete. If it were not already complete, the scope of the project would likely be greater than could be accomplished as a capstone project to be completed by the spring of 2013. I have been assembling the lexicon of terms since 1993 and, over that time period, have engaged thousands of teachers and administrators in workshops, coaching sessions, conference presentations, individual interviews, and classroom observations using the lexicon.

The idea of a lexicon and its utility in professional development began, for me in 1990. Mr. Joel Suzuki, an educational consultant from Burnsville, MN, engaged a group of principals, myself included, with the notion that there are elements of effective instruction that can be observed and developed. Mr. Suzuki's "elements of instruction" borrowed some terms from Madeline Hunter's work, Instructional Theory into Practice (ITIP), and added some additional insights from his experience as a teacher and developer of teachers. In 1993, I crafted a set of terms, based on some of the interesting brain research that was being published at the time, called *Teaching for Meaning* (Rutherford, 1993). In 1995, based on study and classroom observations, I further added to the lexicon and titled that iteration of the work *Creating the Learning Centered School* (Rutherford, 1995), or LCS. The LCS work grew into a professional development initiative that engaged teachers and administrators through workshops, summer conferences, distance learning applications, publications, and a fifteen-part video series. In 2006, based on more classroom observations, literature review, and multiple focus group sessions with teachers and administrators, five more terms were added to the LCS lexicon. This latest iteration of the lexicon is titled *The Artisan Teacher. The Artisan Teacher* is a study of twenty-three themes of skillful teaching. The *Artisan Teacher Field Guide* is designed around these twenty three themes.

This lexicon of twenty-three themes is not intended to be a complete list of all the ways teachers are skillful. It is simply a list of the themes (approaches, principles, skills, ways) that are often seen during the observation of successful teaching. The themes are limited to those that are observable, are effective with children of all ages, and apply to all subject areas.

There are surely many accomplished observers of instruction that would provide a different list of themes, or would edit this one by adding, subtracting, or re-defining some of the terms. And, *The Artisan Teacher Field Guide* is certainly not a final product and additional themes and changes to the existing themes will be made as these changes are judged to be helpful. I say this to establish that, in my thinking, the essential utility of a lexicon of terms is not found in the perfection of the list so long as the list is not defective in any major way. It is found, rather, in the improvement of teaching that results from engagement with the lexicon.

The second and third components of this capstone project, are the writing of a descriptive narrative for each theme and the provision of a set of clasroom examples for each. I have chosen the format of a field guide as a likely successful approach. Unlike a typical chapter book, a field guide, by its definition, is designed to be used in practice rather than to be read apart from practice and then applied later. A field guide accompanies a practitioner into the field to be used there, in the midst of the activity itself. It is incumbent on a useful field guide, then, to be easy to navigate, succinct in its wording, clear in its illustrations, and spare in its elaborations.

I foresee structuring *The Artisan Teacher Field Guide* similarly to any number of field guides one might enlist to better understand insects, birds, fossils, or other naturally occurring phenomena. As examples, listed below are six works that I believe to be exceptionally effective at illuminating their contents in a strategic, organized, and compelling way. These works will serve as key design influences for *The Artisan Teacher Field Guide.*

1. *National Audubon Society Field Guide to Insects and Spiders in North America* (1980).
2. *Field Book for Boys and Men. Boy Scouts of America* (1967).
3. *National Geographic Field Guide to the Birds of Eastern North America* (Dunn, Alderfer, & Lehman, 2001).
4. *The Fifth Discipline Field Book* (Senge, P.M., Kleiner, A., Roberts, C., Ross, R.B., & Smith, B.J., 1994).
5. *A Pattern Language: Towns, Buildings, and Construction* (Alexander, C., Ishakawa, S., Filsdahl-King, I., & Shlomo, S., 1997).
6. *A Perfect Glass of Wine* (St. Pierre, B. 1996).

Of these six influences, *A Pattern Language: Towns, Buildings, and Construction* by Alexander, et al. (1997) is the most substantial. I am amazed at Alexander's ability to provide an accessible entry into the world of architecture and community planning through the illustration of what he calls "a language of patterns" (p. 15). For example, one of Alexander's 211 patterns is called "entrance transition" (p. 198). In this pattern he describes and illustrates how it is more pleasing, architecturally, to avoid an abrupt change from the outside world to the inside world. He suggests that a foyer, lobby, or even a small porch can serve to create this pleasing element called an entrance transition. I can just visualize an architect at her drawing board with a dog-eared copy of *A Pattern Language* at her side, using the clear, cogent descriptions and illustrations to improve her work.

This is what I hope to accomplish with *The Artisan Teacher Field Guide.* I want to create a similar scenario for educators; dog-eared copies of the *Artisan Teacher Field Guide* in the hands of classroom teachers and those who support them being used to improve practice. I'm not so much interested in emulating Alexander's writing style, but rather the way he codifies what he considers the essential elements of effective design.

Why was this capstone selected?

I selected this capstone project based on two criteria. First, that the quality of instruction in K-12 classrooms is not merely one of the many variables that impact student achievement, but is a major variable, one with demonstrated high effect size for increasing student learning. It follows then, that a resource that directly supports and develops this key variable has the potential to produce substantive growth in outcomes all educators count as valuable. In simple terms, *The Artisan Teacher Field Guide* is focused on developing what matters most.

Second, I am personally intrigued and perpetually curious about the effective presentation of content. I find myself just as interested, if not more, in the how a book, or a teacher, or a movie conveys its message than in the content of the message. I believe there are many useful lexicons, sets of terms, and frameworks for practice already available in the body of knowledge that informs quality teaching. What is rarer is a vehicle designed to optimize the quality of engagement with this content. That is where I hope that T*he Artisan Teacher Field Guide* can make a valuable contribution to the field.

When was the capstone implemented?

The Artisan Teacher: A Field Guide to Skillful Teaching has been under development since the summer of 2011, when I first joined the Morehead State University doctoral cohort.

What impact will the capstone have and how will that impact be measured?

It is proposed that the capstone project be limited to the development of the *Artisan Teacher Field Guide* and not to the nature or quality of its subsequent dissemination and application. To extend the capstone project beyond the *Artisan Teacher Field Guide's* development, would be to lengthen the capstone project's completion substantially.

The Artisan Teacher Field Guide is designed to impact professional practice in the following ways.

1. To enhance the quality of teachers' instructional planning and delivery
2. To serve as an accelerator for professional collaboration, reflection, and inquiry
3. To serve as a resource for individual and faculty-wide professional development
4. To enhance administrators' (and other teacher developers) capacity to see patterns of effective classroom practice for the purpose of assessment
5. To enhance administrators' abilities to provide growth-evoking feedback and coaching for the purpose of development

The results described above can and will be measured by employing a number of quantitative and qualitative means. Each item, above, lends itself to direct observational assessment, surveys, portfolios, presentations, time-tracking assessments, video review, tuning protocols, action research, analysis of teacher artifacts, analysis of student work, case studies, and pre-post comparisons.

Limitations of the capstone project

The most significant limitation of *The Artisan Teacher: A Field Guide to Skillful Teaching* is that it is based on the personal experiences and insights of a single person, the author. I selected the twenty-three themes, selected the teachers to be observed in the development of the themes, determined what types of observation data were collected, determined the criteria for how themes were extracted from the observation data, and determined how each theme should be described in the finished work. Therefore, the work is subject to my own personal and professional biases, limited by my own understandings of what I was observing, and limited by my own ability to communicate those understandings.

The capstone project is also limited by the time frame in which it was developed. More time to write additional drafts of each theme description and more time to review the literature avaiable on each theme would have resulted in a potentially more polished and substantive work.

Since the themes contained in the *Artisan Teacher Field Guide* were developed over a period of many years (beginning in 1993) and some of the themes have been a part of several formative collections such as *Teaching for Meaning*

(1993) and *Creating the Learning Centered School* (1995), the current work is subject to a kind of progressive bias, where later iterations of the content build *on*, rather than build *again* the lexicon.

It is easy to spot a school that has had wings or sections added to the original building. While functional, these renovated school floorplans are not as efficient or pleasing as a brand new buidling might have been. It is possible that *The Artisan Teacher Field Guide* is likewise limited by carrying over previous iterations of itself. It may be that a new treatment designed from scratch might have proven more efficient and pleasing. This is a limitation that is unavoidable as long as I am the sole author of the work, since I can't very well clear my memory of all the earlier versions of it. Nevertheless, it is still a limitation.

What are the most valuable reflections or lessons learned from the capstone project?

It has been rewarding for me to go deeper into the science and research that supports and surounds each theme. I have, as a result of this project, gained a significant amount of new knowledge on topics that I thought I had pretty well mastered. So, in that respect, I have gained a measure of intellectual humility as I have become more and more aware of just how much I don't know about the science and art of teaching.

This capstone experience has also taught me much about myself and my own personal rythms and work habits. I've learned again that a quality product can't be rushed, but rather, must be allowed to age a bit before it reaches maturity. I've learned how to write when I don't feel like writing and how to better balance writing with pre-writing, thinking, and researching. And, I've learned how invaluable others' feedback, in terms of both content and style, is to ceating a quality product.

Perhaps most importantly, this project has caused me to reflect deeply on teaching and the development of teachers, the aspects of education for which I have the most enthusiasm. Attempting to write a treatment on what we know about teaching and learning leads me, in all humility, to conclude that there is much more to learn. I'm sure we are just scratching the surface with respect to our knowldege of brain science, learning technologies, and human differences, just to name a few areas. I can only hope, with both humility and optimism, that this work will provide a small step forward, or at the very least, an interesting step sideways, in the quest to advance our understanding of the art, science, and work of teaching.

Capstone Introduction

I have an incurable curiosity for teaching. For over three decades, I've been teaching, observing teachers, and studying teaching. In that time, I've personally observed at least ten thousand episodes of classroom instruction and have spoken with colleagues about thousands more. Since it is generally fulfilling to satisfy one's curiosities, it has been a labor of love and not a bit of drudgery. Contrary to what one might imagine, these thousands of observations have never seemed repetitive or redundant. There is always something new to see, and, the more I look, the more I'm convinced that there are hundreds of ways to be excellent as a teacher.

Early on, I was expecting to be able to quickly spot some consistent actions that would support a template for describing successful teaching. I wished to say that all successful teachers do the same few things. Then I could logically tell other teachers, "Do these few things and you'll be successful too." As it turns out, successful teachers are successful in many ways. Some are well organized, but others, equally successful, are more spontaneous. Many effective teachers are energetic and enthusiastic, yet some excellent performers are quite low key. Some teachers are straight forward and businesslike and produce good results. Still others produce good results through a friendly, relaxed classroom climate. This is not to say that there are not observable, recurring patterns of instruction that especially successful teachers employ. There certainly are, and the remaining pages of this field guide are devoted to describing them. But there are many of them, and teachers employ them in many combinations and in many degrees. Successful teaching is a complex act.

A consistent, recurring pattern has emerged through all these observations. The most successful teachers are skillful. They do things. They make moves. They teach with an attention to detail and a level of execution that produces extra success for learners. They see teaching as a set of skills, some natural and some learned, that combine to produce optimal learning for students. As I have thought about this skillful approach and how it might be best described, I am reminded of an old term that has recently enjoyed a renaissance. The term is *Artisan.* The teachers who best exemplify this skillful approach to instruction are *Artisan Teachers;* skilled in the craft of teaching.

The word artisan, when used as an adjective, connotes a high quality, hand-made, unique nature. An artisan "this or that" implies that a craftsperson created a product in small batches, applying specialized knowledge and skill, with a measure of artistic creativity. We often hear of artisan bread, artisan cheese, or artisan jewelry. Historically, the word artisan is a noun. An artisan is a craftsperson. An artisan makes things. Stonemasons, coppersmiths, bakers, tanners, playwrights, songwriters, and tailors are artisans. The fruits of their labor have utility. They create items of value. The item's value is not entirely based on utility, however. It is also based on beauty, design, and delight. An artisan creates an item that is not only sturdy and functional, but beautiful and delightful to use.

Artisans are not purely artists, though artistic expression is found in their work. Artisans are not purely scientists, though scientific knowledge is essential to their work. Artisans are not merely technicians, though skilled labor is the core expression of their work. An artisan is one skilled in the applied arts, a craftsperson… a unique combination of artist, scientist, and skilled laborer. Excellent teachers are just like this. They are Artisans-artful, knowledgeable, skilled, masters of their craft (Rutherford, 2009a, p. 1).

The Artisan Teacher: A Field Guide to Skillful Teaching is an attempt to identify and organize the patterns of skillful instruction that have emerged from these thousands of observations. I should clarify here, that the field guide is a construction of my own mind. The twenty-three themes represent my best attempt at a cogent and comprehensive treatment of the patterns of successful teaching observed by me, in my career as a teacher and a developer of teachers. It is subject to the biases and misunderstandings that any one observer, however diligent, most probably commits. This work is not a peer-reviewed lexicon of instructional techniques that represents a consensus of the finest minds that ever observed a classroom. It is, rather, more like a field guide that catalogs beautiful birds, written by a single bird lover, an enthusiast, who has spent many hours in the forest looking for and at birds. One might also, keeping with the bird analogy, ask "by whose definition of beauty are these birds deemed the twenty-three most beautiful?" The answer is honest and straightforward, if not statistically comforting. It is by my own definition.

The themes are derived from thousands of classroom observations. Many, even most, of the teachers who were observed were chosen based on a recommendation from their principal. I asked principals to steer me toward three or four of their most successful teachers; teachers who excelled in creativity, innovation, classroom technique, classroom climate, test scores, and parent/student satisfaction. Not every principal knows who their most successful teachers are and some get it very wrong, in my opinion. But, mostly, they get it right. And, over the years they have provided me with a buffet of great teaching to observe and study. Inside the classroom I looked for instances of instruction that resulted in unusually high levels of student engagement, success, effort, clarity, thinking, and performance. I watched for instructional approaches that increased students' speed of learning, recall of content, and transfer of knowledge and skills to new settings. When I saw these things happening, I took close and copious notes on the details of how it was happening. If I saw similar instructional results again and again, I began to craft a description of the instructional approach that most dependably delivered the positive learning results. These descriptions began to sort together as themes and the ones that recurred most often and most dependably became the twenty-three themes contained in this field guide.

Why twenty-three? I honestly wish it had worked out to a more compelling number. Ten would have been nice, or twelve. I've always liked the number eight because it has an elegant symmetry to it, I think. Twenty-one has a nice ring to it. There are twenty-three themes because that is the number of different patterns that had, in my way of thinking, substantially recurring evidence. There are twenty-three themes in the field guide because that number seemed to me, and me alone, to be the number that best described the patterns of successful teaching that I was repeatedly seeing.

The field guide is not intended to be an exhaustive list of all the ways teachers are excellent, but rather a useful way of looking at some of the themes that are most common and have the broadest utility. I have also noticed that successful teachers often have idiosyncratic skills; skills that are theirs alone and are not widely seen in other classrooms. It is intriguing to watch teachers use their "signature moves" at key moments of a lesson. This field guide does not attempt to describe these personal techniques since they are, by definition, not widespread. So, to be included on the list, a theme had to qualify in these four ways:

1. The theme must have utility in all content areas.
2. The theme must have utility for all ages and grade levels.
3. The theme must have a body of research and literature to support it.
4. The theme has to be observed repeatedly in the classrooms of successful teachers.

It is important to note that, in my observations of successful teachers, no one attempts to employ all twenty-three themes on a regular basis and certainly not in a single lesson. To do so would be counterproductive. Instead, Artisan Teachers tend to identify the themes in which they are already skilled and employ those skills first and most often, to the great benefit of their students.

Marcus Buckingham and Donald O. Clifton, in their excellent book *Now Discover Your Strengths*, describe how peak performers in every field approach their craft… "they capitalize on their strengths and manage around their weaknesses" (Buckingham & Clifton, 2001, p. 27). I see artisan teachers taking a similar approach. Instead of obsessing on areas where they are less effective, they identify their key skills, both innate and learned, and lean more heavily on those. They don't ignore their weaknesses, but rather, seek to manage them. *The Artisan Teacher: A Field Guide to Skillful Teaching* is designed to support and enhance this process. Each of the twenty-three themes is presented in an easy to access format that will enable teachers to quickly recognize the themes in their own teaching, determine key skills and strengths, and enhance their practice. Administrators and others with a role in the development of teachers can use the field guide as a resource to support growth-evoking feedback and coaching.

I'd like to gratefully acknowledge the thousands of teachers, who in the midst of a thousand busy days, welcomed me and our observation teams into their classrooms and provided both the inspiration and the evidence for the twenty-three artisan themes. You have been and will continue to be the object of my incurable fascination with excellent teaching.

How to Use This Field Guide

As with all field guides, whether for birds, insects, or wine varieties, this one is organized around topics; in this case twenty-three topics, or themes, of skillful teaching. The themes are arranged in three categories, according to the three aspects of artisanship… artisan as worker, artisan as scientist, and artisan as artist. Other than these three categories, the themes are not arranged in any other specific way. The themes are not sequential and no theme is a prerequisite for the understanding of other themes. There is, however, an underlying structure to the arrangement to the twenty-three themes that supports these approaches.

Read the Field Guide from Front to Back

All the themes are important and represent the best work of countless skillful teachers. As an overview, *The Artisan Teacher: A Field Guide to Skillful Teaching* provides a comprehensive look at many of the most common elements of successful teaching.

Read the Field Guide by Artisan Category

Artisans are skilled workers, curious scientists, and creative artists. The first six themes speak to the fundamental work of teaching. The next twelve describe the science of teaching, and the last five seek to capture the artistic nature of teaching.

Read the Field Guide by Interest

Scan the twenty-three titles and their short descriptions and start with the ones that capture your attention or imagination. Some of the twenty-three themes will likely affirm your own teaching practices and some will represent new approaches that would complement your current practices.

Read the Field Guide by Skill Type

If you're most interested in how content knowledge contributes to teaching success, go first to Clear Learning Goals, Congruency, Task Analysis, or Chunking. If you're most interested in accelerating learning for students, read Personal Relevance, Mental Models, Local Memory, or Connection. If you're curious about assessment ideas, check out Overt Responses and Performance Feedback. Enriched Environments, Success, Neural Downshifting, and Personal Presence all speak to how skillful teachers enhance the affective domain of their classrooms. If you'd like to increase student's recall skills, read Practice, First-Time Learning, or Locale Memory. And classroom management ideas can be found in Conscious Attention, Chunking, Stagecraft, or Time and Timing.

Within each theme, the reader will find a consistent set of elements that are designed to provide access to the themes at progressively greater levels of detail. Each theme chapter contains:

1. A title and short definition that promote quick identification of the theme.
2. An image that captures the essence of the theme pictorially. (Note: This version of the *Artisan Teacher Field Guide* does not contain reference images. These images will be incorporated into text during the graphic design phase of the project.)

3. An elaborative description that further clarifies the definition, describes key ideas from the research and literature on the theme, and provides classroom examples to clarify the concepts.
4. An appendix of school and classroom scenarios from various grade levels and subject areas to promote further understanding and to support the reader's initial application ideas.
5. An appendix containing additional research studies, books, articles, and other suggested resources.

Twenty-three of anything can feel overwhelming. Remember that the *Artisan Teacher Field Guide* is not a list of twenty-three things all teachers should do. It is a list of twenty-three themes of skillful teaching gleaned from thousands of teachers' classrooms. No individual teacher could or should use all of them. The most successful teachers, in my experience, capitalize on the themes where they are already most skilled, enhancing their craft in these key areas. Then, they augment and complement their instructional strengths with a few of the other themes that best fit their key strengths.

It is my hope that *The Artisan Teacher: A Field Guide to Skillful Teaching* will serve as a valuable and easy to navigate resource for teachers and teacher developers. It is offered as both a professional learning tool and also as recognition of the excellent teaching that exists in our classrooms. The field guide's most important purpose is to support the development of ever more skillful teaching… from good to great, and from great to unforgettable.

The Twenty-three Themes

An artisan is one skilled in the applied arts, a craftsperson... a unique combination of artist, scientist, and skilled laborer.

Themes that describe the *technical work* of teaching.

Clear Learning Goals. The ability of the teacher to identify and precisely express what students will know and be able to do as a result of a lesson.

Congruency. The ability of the teacher to design classroom activities that are accurately matched to clear learning goals.

Task Analysis. The ability of the teacher to identify and sequence all the essential steps necessary for mastery of a learning goal.

Diagnosis. The ability of the teacher to verify what students already know and can do for the purpose of determining where to begin instruction.

Overt Responses. The ability of the teacher to regularly obtain evidence of student learning for the purpose of determining next steps for teaching/learning.

Mid-Course Corrections. The ability of the teacher to quickly adapt instruction to meet learning needs based on overt student responses.

Themes that describe the *scientific aspects* of teaching.

Conscious Attention. The ability of the teacher to gain and then focus students' attention on a relevant learning activity.

Chunking. The ability of the teacher to segment the curriculum and learning activities into manageable portions to avoid working memory overload.

Connection. The ability of the teacher to establish a mental link between the intended learning and past learning or experiences.

Practice. The ability of the teacher to improve recall and application of learning through effective rehearsal, repeated effort, drill, repetition, study, and review

Personal Relevance. The ability of the teacher to embed the intended curriculum into issues and contexts that are linked to students' survival or immediate well being.

Locale Memory. The ability of the teacher to enhance learning by organizing information around the learner's position or "locale" in three-dimensional space.

Mental Models. The ability of the teacher to create a structure for learning using images, models, sensory experiences, symbol systems, and creative processing methodologies.

First Time Learning. The ability of the teacher to capitalize on the brain's tendency to attend to, process deeply, and recall information that is presented as new, original, or as an initial experience.

Neural Downshifting. The ability of the teacher to reduce stress and threat in the classroom environment to avoid "survival mode" thinking and to increase higher order thinking.

Enriched Environments. The ability of the teacher to shape the physical and social environment of the classroom to enhance learning.

Success. The ability of the teacher to increase and sustain student effort by designing and adapting learning tasks to ensure that students experience success.

Performance Feedback. The ability of the teacher to increase students' persistence at a task by providing knowledge of results regarding students' work.

Themes that describe the *artistic nature* of teaching.

Stagecraft. The ability of the teacher to enhance, deepen, or prolong student engagement by utilizing a theatrical treatment.

Complementary Elements. The ability of the teacher to sequence instructional experiences that build on the preceding and set the stage for the subsequent.

Time and Timing. The ability of the teacher to strategically manage the duration of learning activities and the intervals between instructional elements in order to optimize learning.

Personal Presence. The ability of the teacher to become a person of significance in the lives of students and to use this position to enhance student engagement.

Delight. The ability of the teacher to create instances of learning that are extra-memorable by designing a "positive surprise"- something that is exceptionally pleasing and unexpected.

Theme 1: Clear Learning Goals

Definition. The ability of the teacher to identify and precisely express what students will know and be able to do as a result of a lesson.

Elaboration. Goals can be powerful motivators. Whether one's aim is to shed a few pounds, clean out a garage, or finish an advanced degree, the act of thinking clearly about a desired outcome makes its accomplishment more likely. The author and management consultant Stephen Covey, in his best-selling book, *The 7 Habits of Highly Effective People*, emphasized the practice of writing a personal mission statement, a set of life goals, as a key to personal effectiveness. Habit number 2, of the seven habits, is "Begin with the End in Mind" (Covey, 1989, p. 95). Covey writes "Begin with the end in mind is based on the principle that all things are created twice. There's a mental or first creation, and a physical or second creation to all things" (Covey, 1989, p. 99). Covey would go on to insist that there is something extra clarifying about the writing down of one's goals. Through the process of actually choosing nouns, verbs, tenses, and modifiers we see our goals more clearly and this added clarity is motivating, even exhilarating. "Writing or reviewing a personal mission statement changes you because if forces you to think through your priorities deeply, carefully, and to align your behavior with your beliefs" (Covey, 1989, p. 129).

The most successful teachers, in my opinion, heed Covey's advice to "begin with the end in mind." Well before the lesson begins, they have first created it in their minds. Guided by adopted curriculum standards, they imagine clearly what they wish for students to know and be able to do by the end of the lesson. Then, they take that extra clarifying step and write it down. By committing their aims to words and choosing just the right nouns, verbs, tenses, and modifiers, they create a blueprint to both guide and inspire accomplishment.

Madeline Hunter's Instructional Theory into Practice (ITIP) model was an early educational application of effectiveness through goal setting. Hunter emphasized that teacher decisions should be guided by a clear statement of the desired learning objectives, both in terms of content and learner performance (Hunter, 1994).

In practice, teachers successfully write clear learning goals in a number of formats. Some begin the goal statement with Students Will Be Able To (SWBAT). *"Students will be able to add fractions with unlike denominators."* Some use The Learner Will (TLW). *"The learner will analyze energy flow through an ecosystem."* Some use "I can statements." *"I can use commas correctly in my writing."* Some pose the goal as an Essential Question (EQ). *"How can I use figurative language to make my writing more interesting?"* Some use language from state curriculum standards. *"0407.3.2: Investigate different ways that organisms meet their energy needs."* And some take care to write the goals in student friendly terms. *"We understand that each digit in a two digit number represents amounts of tens and ones."*

The purpose of writing clear learning goals is to create a mental image (for teacher and student) of a desired future state, and then to clarify that image by specifically describing it in terms of student thinking, learning, and performance (Reeves, 2011). When goals are clarified in this way, no matter the format, both teachers and students are able to pursue the work of learning with more focus, intentionality, commitment, and motivation. And, they are better able to mark progress and make adjustments along the way.

Success principles for clear learning goals.

Clear learning goals describe student learning, not classroom activities. *"Students will complete their four color map projects."* This statement describes a classroom activity, not a learning goal. *"Students will analyze population density statistics and create a graphic map display to show differences across the state."* This goal is clearer. It speaks to the students' thinking and the performances that demonstrate learning.

Clear learning goals describe both content and performance. Typically, a goal statement expresses content as nouns and performances as verbs. An incomplete sentence, therefore, represents an incomplete goal. *"Students will diagram the four* *steps of the water cycle and explain how each step leads to the next."* This is a complete sentence. "Four steps of the water cycle," is not.

Clear learning goals contain clear verbs. *Diagram, identify, compare, solve,* and *create* are clearer verbs than *know about, understand, appreciate,* and *cover.* Clear verbs turn invisible, cognitive processes like *understand* and *appreciate* into visible, physical expressions that can be observed and assessed (Bloom, 1956). The verb *appreciate* in "Students will *appreciate* the concept of checks and balances in the federal government." is an invisible, cognitive function. Adding "by creating a diagram of the three branches of government showing the powers of each" adds a visible, physical element that is observable and assessable. A popular and effective way to test verb clarity is to apply the "Hey Dad watch me..." test (Mager, 1984). Just place the verb after the stem, "Hey Dad watch me..." and see if it makes sense. "Hey Dad watch me diagram the functions of the three branches of government." seems more plausible than "Hey Dad, watch me appreciate democracy."

Clear learning goals pervade the lesson, not simply begin the lesson. In addition to writing and sharing a goal statement at the beginning of a lesson, teachers do well to return to the goal statement several times throughout the lesson. I've observed teachers who enhance the effects of clear goals by asking students to verbalize the goal and explain it in their own words. Others ask students to write it on top of their work, affix a learning goal sticker to their projects, pause for a goal check in the midst of a learning activity, sing the goal, or place a goal statement at each center where students will work throughout the day.

Theme 2: Congruency

Definition. The ability of the teacher to design classroom activities that are accurately matched to clear learning goals.

Elaboration. Congruency is linked to, and dependent upon, clear learning goals. The essence of congruency is to match or align with something. Congruent things must have a target or another thing to which they are an exact match. Congruency is indefinable in the absence of a target. Just as one cannot give directions to an unknown destination, or dress appropriately for an unknown event, one cannot teach toward an unknown learning goal. So, by definition, congruent instructional activities cannot exist apart from a clear learning goal.

Essentially, congruency is a time management issue. The relationship between time and learning has been much studied. John Carroll made an early case for the time-learning effect in his 1963 work, *A Model for School Learning*. Carroll wrote "The learner will succeed in learning a given task to the extent that he spends the amount of time he needs to learn the task" (Carroll, 1963, p. 725). The amount of time that students are engaged in learning has a powerful and consistent effect on the amount of learning that takes place (Walberg, 1988).

To be sure, there is much more to learning than spending enough time on it. (Kohn, 2006). "Time is a necessary, but not sufficient condition for learning. Learning takes time, but providing time does not, in itself, ensure that learning will take place" (Karweit, 1987, p.33). On balance, however, it is hard to argue that a clear eyed understanding of learning goals and the congruent activities that will most probably accomplish them are not important, even essential, skills for successful teaching. In this chapter, I'll use the term activities to stand in for all types of instructional designs, approaches, and practices.

Success principles for congruency.

Goal Orientation. I've observed that classrooms seem to fall into one of two rough categories, activity-oriented or goal-oriented. In an activity-oriented classroom, the teacher plans the day as a string of activities. The activities are chosen based on their merits- what works, what the teacher likes, what matches the energy needs of the classroom, what was learned in staff development recently, what materials are available, or what other teachers have recommended. The activities are not necessarily off goal, but may be, at least partially, since they were selected based not on their congruency to a clear goal, but on other merits. The temptation to select activities first is strong. From a teacher's survival perspective, it is possible to survive the day without clear goals. It is impossible, however, to survive the day with no activities! In a goal-oriented classroom the teacher first develops clear learning goals, *then* chooses activities that best serve those goals based first on their congruency, and then on their other merits.

Most approaches to time management involve a clarification of one's goals, and then a detailed plan designed to accomplish the goals (Covey, 1989). Notice the sequence. It is *first*, establish goals, *then*, determine activities. This makes sense for instructional planning too. Once a clear learning goal (see Chapter 1, Clear Learning Goals, for more information) is established, congruency speaks to the ability of the teacher to match classroom resources and approaches to the goal. First, determine learning goals. Then, choose activities that serve the goals. Activities serve goals, not the other way around. This is the essence of goal orientation.

Stick-to-it-ive-ness. Teaching is not for the easily thwarted. Every day in every classroom, there are multiple opportunities to get sidetracked. There are interruptions, emergencies, announcements, attention deficits, family issues, personal issues, administrative issues, technology issues, and just plain fatigue. In and through all this, the teacher who can keep her eyes on the goal and simply stick with it, or at least keep coming back to it, serves her students well.

Discernment. Some teachers have a knack, a gift really, for quickly recognizing a potential activity's level of congruency. They can spot incongruent activities quickly, identify which parts of an activity are congruent and which are not, and can avoid being fooled by an activity's other merits. The key skill here is the ability to *discern* (distinguish between) classroom activities that are *congruent* (an exact match to the goal) from those which are merely *correlated* (has some relationship to the goal).

A discerning 9^{th} grade science teacher worries that the time her students are spending on projects for the school's annual science fair isn't delivering a big enough return on their investment. Often, the experimental elements are accomplished rather quickly and the concepts mastered soon thereafter. Then, lots of time is spent coloring, cutting, pasting, decorating, and displaying the experiment in order to impress the judges. The discerning teacher decides that the experimental and concept mastery work is congruent to the class's learning goals, but that the work of decorating and displaying the results is only correlated.

The 2nd grade teacher states this learning goal: *I can explain how illustrations support a text and help to create a mood. RL.3.7.* The first activity asks students to view various illustrations from favorite books and describe the mood that each illustration evokes. They volunteer "sad," "scary," and "funny" to describe the moods they feel for each illustration. "Pretty good" the teacher thinks to herself, "but this only addresses part of the goal. I have to find some way to have them explain how the illustrations support the text." She then asks students to read short, un-illustrated text excerpts and describe the moods they feel after each reading. They volunteer "suspenseful," "joyful," and "surprised." Next, she posts the mood words from both exercises on a big board and asks students to arrange illustrations and text excerpts around the mood words that each illustration or text excerpt best fits, showing the connections with yarn and push pins. The visual representation that emerges shows how illustrations are linked to moods and how illustrations, through the moods they evoke, can support the text. "That's pretty close" the teacher thinks as she discerns the match between the goal and her activities.

Theme 3: Task Analysis

Definition. The ability of the teacher to identify and sequence the essential steps necessary for mastery of a learning goal.

Elaboration. Any complex and important act merits a thorough thinking through before one commences to action, especially in cases where failure is unacceptable or not easily corrected. This thinking through process is called a task analysis.

An airline pilot files a flight plan that details the flight, destination, waypoints, route, altitude, and passenger list. Before departure though, the pilot goes through a pre-flight checklist to ensure that the aircraft is safe and able to fly. The checklist includes all the major systems on the aircraft and is designed to be performed in a prescribed sequence. This is a task analysis.

An architect creates a blueprint from which a home will be built, but it is the construction plan, developed after the blueprint, that specifies exactly what will be done and in what sequence to stay on schedule and to minimize costs. The site must be cleared of trees before construction can begin. While the expensive grading equipment is on site, it makes sense to dig the sewer and utility trenches right away, even though they won't be needed until later in the project. The construction manager understands this and schedules the heavy equipment accordingly. The construction plan calls for all the masonry work to be completed on consecutive days, even though the brickwork doesn't hold up other tasks and could be done in segments. As it turns out, because of a positive learning curve (Thomas, Matthews, & Ward, 1986), masons will complete the brickwork in less time, at a lower cost, and with higher quality workmanship if they are not interrupted, but rather can complete the entire façade of the building in consecutive days. The construction manager understands the interplay of all these variables and plans accordingly (Baker, 1974). This is a task analysis.

The character Sherlock Holmes noted "Most people, if you describe a train of events to them, will tell you what the result would be. They can put those events together in their minds, and argue that something will come to pass. There are a few people, however, who, if you told them a result, would be able to evolve from their own inner consciousness what the steps were that led up to that result. This power is what I mean when I talk of reasoning backward." (Doyle, 1930, p.83).

Teachers are kindred souls to pilots, constructional managers, and detectives. When they examine learning goals carefully and plan for the exact sequence of cognitive, physical, or affective experiences that will engender optimal learning for their students, they are using task analysis to ensure success. Task analysis is called for, both inside and outside of education, when stakes are high, failure is especially costly, and when there is complex interplay among the variables for success (Gagne, 1963).

We don't perform pre-drive checklists before driving to the corner store. If the car dies, we'll just call for help. A construction plan is not needed for adding a bookshelf to one's office and we need not involve Sherlock Holmes to solve a convenience store robbery. Likewise, not every episode of instruction requires a task analysis. Some, maybe even most, learning goals are straightforward and uncomplicated. Task analysis is called for when planning key, important concepts that will serve as the foundation for much future learning, when learning goals are more complex and intertwined, and/or when students have historically shown a wide achievement gap. When learning goals are complex, it is easy to overlook key steps.

(Jonassen, Tessmer & Hannum, 1999) refer to task analysis as a blueprint for instruction. "Without the blueprint, important parts of the lesson may be ignored, or the components and activities may not support each other" (Jonessen, et.al., 1999, p. vii). Arlin (1984) details how students have multiple opportunities to fail when the curriculum is complex and each step builds on the assumption of mastery of previous steps. "A student who begins a learning sequence by performing poorly on the first step performs even more poorly on the second step because he lacks some of the prerequisites. Without extra time to restudy these prerequisites, he misses more prerequisites at each successive step, becoming progressively farther behind. So the academically rich get richer and the academically poor get poorer" (Arlin, 1984, p.67).

Success principles for task analysis.

Task analysis is a 3 step process: First, establish a clear learning goal (see Chapter 1). A task analysis cannot, by definition, be developed without a clear aiming point or predetermined result. Second, list all the essential sub-learnings that are necessary for mastery of the learning goal. Don't worry about sequence at this point, just list everything that a learner needs to know and be able to do to master the stated learning goal. For example, if the learning goal is: *Students will be able to add fractions with unlike denominators*. Then the list would include, identifying numerators and denominators, finding the greatest common factor, finding the least common denominator, writing complex numbers as improper fractions, etc. Step 3: Sequence the sub-learnings. Look at the list and decide which should come first, then second, then third, etc. Sometimes this decision will be straightforward because the content contains dependent sequences. Multiplication must precede division. One must master the concept of verbs before one attempts adverbs and gerunds. Sometimes the content is not sequentially dependent. When one learns the three additive primary colors, it does not matter if the sequence is red, yellow, blue or blue, red, yellow, just so they are all included. In this case, a sequence still needs to be determined, but it can be based on other considerations.

Include only essential sub-learnings. A task analysis is not a list of all the things that *might* be included in a lesson sequence. It is a list of all the things that *must* be included. A task analysis is best viewed as a lean construct, containing only those items that are absolutely essential for mastery of the leaning goal. When learning to swim, one might as well learn to float also. But floating would not be included in the task analysis for swimming because it is not essential. One can learn to swim without learning how to float.

Include sub-learnings, not activities. A task analysis is a sequenced list of essential sub-learnings, not a list of activities. If activities are allowed to be a part of a task analysis, the door is open to learners successfully completing the activities, but not mastering the learning. Using the example of swimming again, if the goal is to learn to swim using the crawl stroke, then "learning to flutter kick" might be one of the essential sub-learnings. The activity "kick-boarding," using a small foam board to keep the upper body afloat so the swimmer can isolate and improve kicking technique, might be a good way to teach the flutter kick, but it would not appear on a task analysis. It is an activity, not a sub-learning. It is possible to do well with kick-boarding, but still not learn the flutter kick. A task analysis is a sequenced list of essential sub-learnings, not a list of activities.

Develop task analyses collaboratively. A task analysis, since it involves some complexity and judgment is best developed by a team of teachers. No one teacher likely knows all the steps or has anticipated all the twists and turns in a learning sequence. With respect to task analysis, two heads, or better yet five or six, are better than one.

Theme 4: Diagnosis

Definition. The ability of the teacher to verify what students already know and can do for the purpose of determining where to begin instruction.

Elaboration. Formative assessment can be defined as the frequent, interactive evoking of evidence of student progress and understanding which can be used as feedback to adjust teaching and learning (Black & William, 1998). For the purpose of *The Artisan Teacher: A Field Guide to Skillful Teaching*, which is to identify and explore common, recurring themes of skillful teaching, it seems helpful to divide this important aspect of teaching into two themes. I'll call formative assessment that occurs prior to the commencement of a lesson, for the purpose of determining where to begin instruction, *Diagnosis*, (this chapter, 4). Formative assessment that occurs during instruction, for the purpose of determining adjustments and next steps, will be called *Overt Responses* (see chapter 5). The techniques and approaches observed as teachers successfully employ diagnosis and overt responses are similar, and in some respects identical. The difference between the two, and the reason for dividing these skill patterns into two themes, is timing and purpose. Diagnosis elicits evidence of learning for the purpose of choosing the best starting point for a lesson. Overt responses are elicited for the purpose of adjusting instruction in the midst of the lesson.

Diagnosis is often used as a medical term and understanding it as such provides a helpful perspective. Much time in a physician's education and training is spent developing diagnostic skills. Swelling, a rash, but no fever indicates an allergic reaction, but localized swelling and redness might indicate an insect bite instead. The physician is trained to gather and interpret evidence. To gather the needed evidence, the physician uses techniques that make the invisible, inner workings of the body, apparent, visible, and measureable. Physicians, and educators, rely on three types (levels, depths) of diagnosis: formal, informal and inferential.

Formal diagnosis involves a thorough and extensive battery of tests and measurements. A thorough yearly "physical" is an example. Based on these results, a patient's overall health can be determined and also areas of concern. Formal classroom diagnosis, similarly, involves batteries of tests and assessments which provide a comprehensive, albeit expensive and time consuming, look at a students' overall academic fitness.

Informal diagnosis involves a quick check of specific evidence to address a specific ailment. After thirty minutes in the doctor's office, we leave with a prescription and feel better in a few days. In the classroom, teachers use informal diagnosis to gather and interpret a quick sample of student work that relates directly to the upcoming learning task.

Inferential diagnosis is not based on any direct evidence, but on the doctor's educated guess. The doctor might infer "Let's see... it's February and you're an elementary school teacher. I'm guessing you caught the flu from one of your students." A teacher might infer "We're two months into this biology course, so you should probably know about chromosomes and genes, but you're probably not yet familiar with Punnett squares. So, that's where we'll start today." Inferential diagnosis, in medicine or education, is fast, but risky, and often inaccurate.

In medicine and education, all three types of diagnosis have their place. It is a physician's, and a teacher's, *informal diagnosis* skills, however, that are most prized. Skilled practitioners have techniques for quickly eliciting key information from their patients (students) and using that information to design treatments (lessons) that are "just what the doctor ordered."

Before commencing a unit on mammals, a third grade teacher uses a KWL chart (a three column list of what students already know, what they wish to know, and what they learned in the lesson) to list things that students already know about mammals and what they want to know. As the students volunteer information, the teacher listens, probes, and follows up with each response in order to interpret the class's prior knowledge (Ciofalo & Wylie, 2006). This ten minute informal diagnosis gets the students thinking in the right direction and also provides the teacher with information needed to determine the best starting point for the lesson.

The U.S. History teacher passes out a five question quiz on the great depression. "Don't worry. This is not for a grade. I just want to see how much you already know about the great depression so I don't spend our valuable time teaching things you already know."

The 2nd grade teacher uses several informal reading inventories to assess students' readiness in phonics, fluency, and vocabulary. The inventories are mostly checklists. She engages students in small groups and makes tallies on the checklists each time a student demonstrates the specific skill being assessed. After fifteen minutes or so with each reading group, the teacher scans the checklists to identify trends and themes. She plans the upcoming reading lesson accordingly.

A high school art teacher explains to his students "The human face is one of the most challenging things to sketch accurately. I'd like you to take a sheet of sketch paper and draw a human face as you see it in your mind's eye. I want you to work quickly and simply block out the major features- eyes, nose mouth, ears, and hair. You have five minutes. Go!" As the students draw, the teacher circulates around the studio to observe their work. The teacher is not only looking for how well they sketch, but for what this quick draw activity reveals about their preconceptions, or misconceptions, about the structure of the human face (Johnston, Markel, & Haley-Oliphant, 1987). After surveying their work, the teacher identifies common misunderstandings and begins the unit with the three most common misconceptions about the human face.

In each case, the teacher uses an informal diagnosis, collecting quick bits of information from students just prior to engaging them in a new, or the next, learning experience. These bits of information, though not comprehensive or complete, can, in the mind of a talented teacher, inform an interpretation of approximately where the students are. This, in turn, informs the teaching decision of where to begin the next lesson (Heritage, 2010). When teachers begin lessons at just the place students are next ready to be successful, and then keep checking and adjusting to keep instruction at or near this right place, student engagement and learning is optimized (Vygotsky, 1978, 1986; Popham, 2011).

Theme 5: Overt Responses

Definition. The ability of the teacher to regularly obtain evidence of student learning for the purpose of determining next steps for teaching.

Elaboration. Back in the "old days" of full service gas stations, the attendant would politely ask "Check the oil, sir?" I can still picture my dad popping the hood latch and responding, "Yes, please do." The attendant then reached under the hood and pulled out a long metal strip. He wiped it off and then reinserted it, waited a second, then pulled it out again. By this time my dad was usually at the attendant's side and they both looked intently at the dipstick to see the line of oil that indicated the engine's oil level. This fascinated me, that a car would have such an ingenious device as a dipstick that allowed a direct observation into the invisible inner workings of the engine. It doesn't take much to fascinate an eight year old boy, and dipsticks are not exactly high tech by today's standards, but the essential principle is timeless. *To understand, one must have a way to look inside, to make the invisible visible.*

Wouldn't it be great if students came equipped with dipsticks? Halfway through a math lesson a teacher could extract the dipsticks, check the levels of learning, then make some adjustments. Of course, this is exactly what successful teachers do every day. They have ways of making the invisible, inner workings of students' minds visible.

These "ways of seeing the invisible" are called overt responses. The process is also referred to as checking for understanding, monitoring, or formative assessment. Teachers who regularly elicit overt responses from students reap benefits in two ways.

First, they gain specific and immediate information about how students are doing. This "just in time" information is critical to making immediate adjustments to instruction (Sime & Boyce, 1969).

Second, the process of eliciting overt responses promotes a more active, participative, and engaging learning environment. A classroom rich in overt responses is,.by design, a classroom characterized by much active interplay among teacher and students. Research has consistently found student leaning to be enhanced by direct engagement with teachers rather than extensive reliance on individual seatwork or written assignments (Gutierrez & Slavin, 1991). Students in classrooms which rely mostly on seatwork or where students engage extensively with educational materials, rather than with the teacher and other students, are less likely to actively process new material (Walberg, 1991).

Success principles for overt responses.

Elicit overt responses from all students. This is, admittedly, a difficult standard to reach. It is, nevertheless, crucial. To elicit overt responses from less than 100% of the students is to, by design, leave the learning of some students unchecked. In statistics and survey methodology, this approach is called sampling. Sampling is "the act, process, or technique of selecting a representative part of a population for the purpose of determining parameters or characteristics of the whole population." (http://www.meriam-webster.com/dictionary/sampling). Sampling is cheaper and faster than obtaining responses from an entire population, and so it has its place as a statistical technique. It is, however, a dubious practice in the classroom, where knowledge of each individual's work is just as, if not more, important as knowledge of the class's work. Who would go to a hospital where the nursing staff only checked on every fifth patient and then planned treatments based on this statistical sample of patient's conditions? Besides the lack of information that classroom sampling provides, the practice also does not adequately deliver the second benefit of overt responses; a classroom climate of active engagement. I recall countless classroom observations where most students listen as a few students respond to the teacher's prompts or questions. These episodes of instruction were usually characterized by low energy, lack of active processing, and increasingly off task behaviors.

Another way to think about collecting overt responses from all students is to think of engagement techniques as being either mandatory or optional for students. Mandatory engagement requires overt responses. The students' level of engagement is increased through an instructional design that intentionally elicits overt responses. Mandatory engagement is a function of the teacher's design for engagement and does not rely too much on the students' cooperation or motivation. Optional engagement provides an opportunity for students to engage, but stops short of asking them to do so overtly.

A second grade teacher writes two numbers on the board with a blank in between. She then asks her students to think to themselves whether a >, <, or = sign should go between the numbers. After a thinking pause, the teacher says "show me" and *all* the students use their fingers to make a >,< or = sign. The teacher scans each child's hand signal and then says, "Let's do another one."

A 9th grade English teacher positions students desks in a U shape and stands in the center of the open end. Each student has a sheet of text and a yellow highlighter. The teacher asks students to highlight all the dependent clauses in the text. The teacher, knowing there are five dependent clauses in the text, and knowing the position of each on the page, can see the work of *all* students and see immediately who is correctly identifying the dependent clauses, and who is not.

Overt responses must be visible and countable. Overt engagement produces a work product that can be verified– the teacher can see it, hear it, touch it, taste it, or smell it. The art teacher says to her class, "I want you to hold up your drawing and point to your horizon line." The results here are visible. Students could decide not to hold up their drawings, but it would be obvious and evident to the teacher. In collecting overt responses, teachers look for *proof* of learning, *evidence* of thinking, and *artifacts* of performance.

Covert engagement produces a work product that is internal, mental, or hidden, such that it cannot be verified with certainty. The language arts teacher is reading a passage from a novel and asks students to imagine a scene. "Can you smell the wood fire burning? Is the wind in your face or at your back?" Students have their eyes closed and seem to be imagining something. The work is not verifiable, however. A student could choose not to engage and remain undiscovered. Overt engagement drives learning and so does covert engagement. Engagement of either type is positive and productive. The advantage of overt engagement is that it increases the probability that students will engage by making the engagement or the non-engagement visible. Not all engagement can be overt, but a healthy combination of overt and covert can greatly increase the probability of both types of engagement (Rutherford, 2009b).

Overt responses should be gathered during instruction, not following instruction. An exit slip, ticket out the door, or quiz at the end of the day are each productive strategies, but none are, by definition, overt responses. Overt responses occur *during* instruction, so that the benefits of active engagement and authentic assessment can be realized right away.

Madeline Hunter, in a presentation I attended in 1988, said something that I've always remembered because of its simplicity and poignancy. She said "You can recognize a master teacher by her pace. It's: teach – teach – check. Teach – teach – check." (Hunter, 1988). "I've got it!" I said to myself. "It's not: teach – teach – teach

– teach – teach – and then, check at the end. The checking has to be right there with the teaching."

I observed a third grade teacher at the very beginning of a lesson. She began by giving directions on where the students were to go and what they were to do once the activity began. After speaking for just a moment, the teacher stopped and asked students to pair up and explain the directions so far to an imaginary new student who just joined the group. "I'll listen in to see how you do," she said. I thought to myself, "Wow! she hasn't even begun the activity and she is already checking for understanding using overt responses."

Don't just invite engagement. Plan for it. Teachers should plan their engagement strategies right along with their instructional strategies. A teacher might think, "From 10:00 a.m. till 10:15 a.m. this morning I want to review for the upcoming quiz by asking students sample questions and giving them some additional practice at answering." And also think, "I'll do this by posing a question to the whole class, asking students to pause 15 seconds to think, then providing 15 more seconds for each student to write their answer on their mini white boards. Then I'll say, show me." The first thought was an *instructional* plan, the second thought was an *engagement* plan (Rutherford, 2009b).

When observing classroom instruction, I am often amazed at the high quality and rigor of questions, discussions, and activities teachers devise for students. I am frustrated though, when I notice that not all the students are engaging in the teachers' designs. It strikes me as a bit of a waste of effort and teaching talent.

So, if a book is not read, is it still a good book? If a doctor's advice is not followed, is it still good advice? In a pure sense, the answer is probably yes to both these questions. But in a practical sense, one has to wonder, "What's the point?" There is a sense of sad incompleteness when a good work, because of a lack of engagement, produces little or no result (Rutherford, 2009b). Perhaps this is why my mother demanded that I eat all the food on my plate. She said, "Children are starving in Ethiopia." I suspect what she meant was, "I invested a good bit of time and talent into the making of this meal. It would be a shame to waste it."

Theme 6: Mid-Course Corrections

Definition. The ability of the teacher to quickly adapt instruction to meet students' immediate learning needs.

Elaboration. It would seem that almost every complex and wondrous creation is the product of a worthy goal and a willingness to make adjustments along the way. A novelist begins a work with a clear plan for the story, but is open to adjustments as the characters and plot unfold into words. Sometimes the best vacation memories result from spontaneous side trips or last minute changes to the itinerary.

The Apollo 11 mission to the moon involved a detailed mission plan, but also thousands of mid-course corrections. Perhaps the most famous adjustment to the plan was Neil Armstrong's manual landing of the craft after it overshot its landing point by four miles. It wasn't in the script, but Armstrong took the craft's controls, found a new landing area among boulders and craters, and deftly landed the Eagle with only sixteen seconds of fuel left in the tanks (Shepard, Slayton, & Barbee, 1994).

The lesson from all these examples is that mid-course corrections are integral to the creative process. Note that mid-course corrections are not changes to the goal, but rather, changes to the steps, strategies, or activities designed to reach the goal. The changes are possible because of new information that is only available once the journey is underway. Mid-course corrections don't make goal setting and detailed planning obsolete. On the contrary, mid-course corrections ensure that important goals, especially lofty, complex ones, have the maximum opportunity for accomplishment.

Classroom mid-course corrections work the same way. When teachers assess student learning often and, based on what is found, make immediate adjustments to instruction, learning is optimized (Dwyer, 2008; Heritage, 2010). The window for instructional adaption is often small. This places a premium on the teacher's ability to make changes quickly, often in the midst of an instructional sequence. Popham (2011) writes, "It is difficult to argue with the instructional virtues of immediacy; any sort of self-correcting system is certain to work better if along the way corrections are made as quickly as possible" (p. 48). It is important that formative assessment (See Chapter 5, Overt Responses) practices be embedded into instruction, not designed to follow it (William & Thompson, 2007). "Formative assessment is part of the instructional process. When incorporated into classroom practice, it provides the information needed to adjust teaching and learning *while they are happening*" (emphasis mine) (Garrison & Ehringhaus, 2007, p.1).

Mid-course corrections can take many forms. Teachers, based on their interpretation of formative assessment data, might decide to alter the pace of the lesson, use different activities or approaches, change the grouping of students, change the level of materials, or any other combination of adjustments. Here, in no particular order, are six common types of mid-course corrections:

Practice. When students are at the cusp of (upon or near) mastery, it is an effective move to provide additional opportunities for practice and rehearsal of newly acquired skills. This early practice can consolidate gains and prevent regression from mastery (Landauer & Bjork, 1978).

Re-teach. Sometimes it actually saves time to just start over. If, upon assessment, a significant number of students are a significant distance from mastery, then a new approach may be in order. The teacher should "own" the change. "Friends, the way I just taught that did not make much sense to many of you. Give me another chance, OK? Let's try it this way." The new way, of course, should be quite different from the first way with new activities, new groupings, new sequences, new examples, and, hopefully, new results.

Abandon. Well, temporarily abandon, anyway. Sometimes, the best way to success is to delay. Perhaps it is too late in the afternoon to begin a new concept, or a fire drill interrupts the class's focus, or a discipline issue stirs up too much anxiety. In cases such as this, a smart decision may be to delay the lesson until a time when success is more likely. Kenny Rogers had the right idea in his hit country song, "The Gambler." Rogers sang *"...You've got to know when to hold 'em and know when to fold 'em..."* (Rogers, 1978).

Move on. Sometimes, assessment shows that students are ahead of the expected pace. In this case, practice repetitions can be reduced, time can be saved, and the next concept or skill can be introduced sooner than planned.

Extend. State and national standards are written as minimums, not maximums. Sometimes, as students master a concept, the teacher might decide to teach it to a higher level, or deepen students' understanding beyond what is expected.

Connect. Sometimes, even when students have done well enough in mastering an isolated skill or concept, the teacher may decide to spend time building connections to other content, other experiences, or other skills. Knowing that elaboration promotes transfer (Caine & Caine, 1994), the teacher might intentionally spend time building or connecting schema for the purpose of future recall and transfer (see also chapter 9, Connection).

Theme 7: Conscious Attention

Definition. The ability of the teacher to gain students' attention, focus it on relevant learning tasks, and avoid distractions.

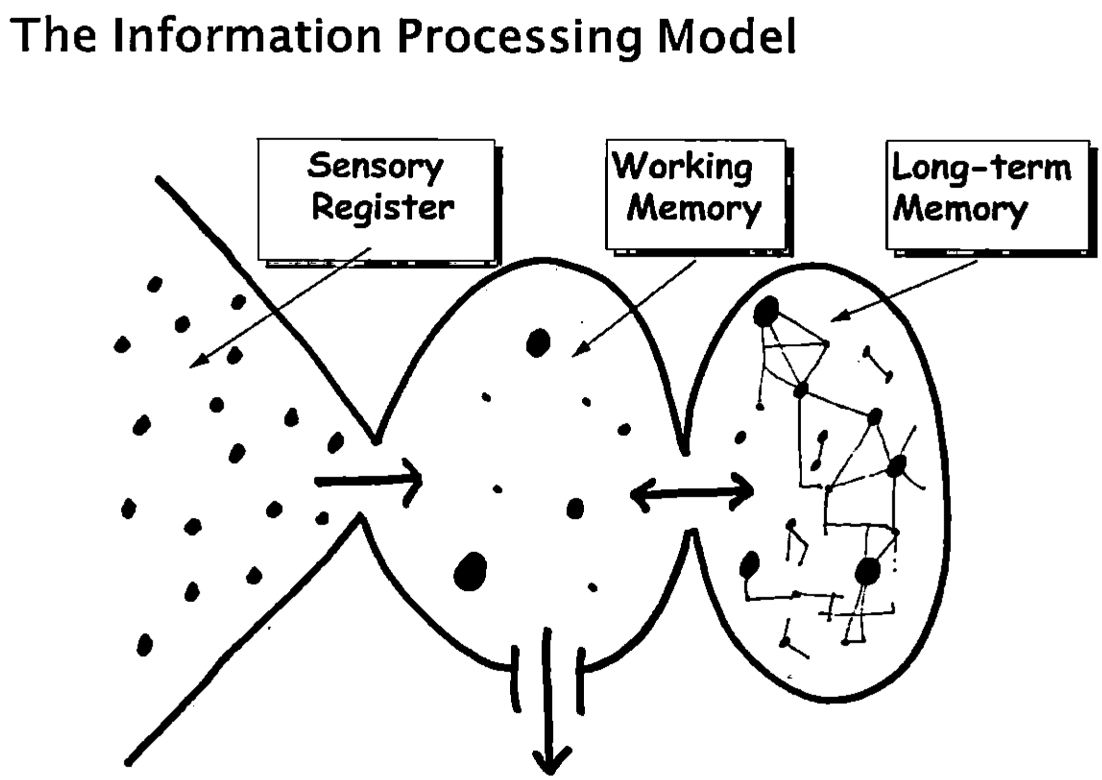
Elaboration. From the beginning of time, it seems, teachers have been imploring their students to "pay attention." And for good reason, attention is not the same as learning, but it is a prerequisite to learning. We tend to actually learn, (remember) a small percentage of all the things to which we pay some attention

(Sylwester & Choo, 1992). Therefore, a teacher's ability to gain, focus, direct, and deepen student attention is essential to classroom success. The absence of student attention is doubly detrimental in that even well designed lessons involving rich learning experiences are only partially effective in the absence of students' full attention and engagement.

Information processing theory suggests that the human brain handles incoming information like a computer would (Orey, 2001). Diagrams such as Figure 1, below, are often used to depict how the informational processing model works (Rutherford, 1995).

Discreet chunks (Miller, 1956) of information, such as numbers, words, faces, songs, or ideas are represented by dots in the diagram. The chunks move first from the environment into the sensory register where they are scanned for importance. A few chunks, those deemed to be most important, move into the working memory (also called short-term memory) for closer consideration, and then some chunks, because of rehearsal or inherent relevance, are moved to long-term memory for storage and recall (Caine & Caine, 1994). Attention, according to the information processing model, can be thought of as the brain's extraction of a few important chunks from the sensory register. The chunks that are selected can be said to receive our *conscious attention*. Those that are not selected pass through our subconscious, but never occupy a place in consciousness, or working memory.

Figure 1.



A radio receiver operates much the same way and can be a helpful analogy. At any moment a radio receives signals from many stations, but "tunes in" only one and excludes the others. This "tuning in" function is what allows the human brain to receive many signals , but "pay attention" to only one. In the classroom, teachers can help students "tune in" their focus on a learning task and exclude other attentions.

Three ways to gain and direct student attention.

Invitation. Humans can direct their conscious attention. Our attention is under our intentional control. We don't always direct our attention by conscious choice, and we often do not, but, we can direct our attention when we choose to do so. Therefore, one simple, but effective, way to engage student's attention is to *invite* them to intentionally extract a specific chunk from the sensory register. A teacher might say "I'd like you to pay special attention to the next step in the experiment. Something surprising is about to happen and I don't want you to miss it." Many students, if not all, will accept the teacher's invitation and intentionally direct their conscious attention to the experiment. The key to a successful invitation is to cause the student to make a *conscious* choice concerning his immediate attention. If left to subconscious processing, the student's brain might choose to focus on any number of targets. A teacher once said "Touch your left ear if you're paying attention and your right ear if you are not." In order to comply, each student had to stop and consciously consider whether or not he was paying attention... and in so doing, he was, by design, then paying attention.

Discrepancy. As a feature of our survival instincts, we are compelled to pay attention, if only for a moment, to anything that is different, surprising, or discrepant. In a sea of vehicles on the freeway, the bright yellow/orange school bus stands out. Many states require that hunters wear blaze orange so as not to be mistaken for game as they move through the forest. A quick glance at the breaker box is sufficient to tell which breaker is tripped. The principle of discrepancy is at work in each of these examples. The brain is designed to closely examine anything that doesn't fit into the expected background.

Teachers can use the brain's innate recognition of discrepant events to direct student attention. A teacher who usually talks fast, but slows to a crawl for effect, enjoys a brief burst of attention from students who recognize the change in pace as a discrepancy. Standing in a new place, using a different color marker, speaking in an unusual accent, or asking students to stand and face east, can all invoke an attention response due to the discrepancy of the action.

A process that opposes the attention enhancing properties of discrepancy is *habituation*. Habituation is the brain's ability and tendency to withhold conscious attention from any stimuli that is regularly repeated. Upon entering a room for a meeting, one might notice an annoying hum in the ventilation system. After thirty minutes of the meeting, however, the hum is barely noticed. Due to habituation, some people don't mind living near an airport or railroad tracks, since the loud noises are no longer discrepant, but a part of the expected environment. Where classroom attention is concerned, discrepancy can be a powerful ally. Habituation, however, is the enemy of conscious attention.

Two cautions need to be considered when using discrepancy. First, don't overuse discrepancy. If repeated too often or too regularly an event ceases to be discrepant. I suppose the first time a teacher ever flipped the lights on and off in a classroom, students stopped what they were doing and paid attention. If used too often though, the effect is habituation, not discrepancy. "That's just the way the lights work in this classroom," a student thinks to himself as they start blinking on and off again.

Second, don't make things too discrepant. The discrepancy, if too vivid, can become the object of memory rather than the intended curriculum. I recall Dr.

Madeline Hunter once saying "Don't use a live elephant to teach the color grey." Well said.

Emotional Hook. We tend to focus first and best on events that have some emotional significance. Perhaps as an expression of our survival tendencies, we tend to focus our attention on things that trigger an emotional or affective response. Events or items that evoke anger, sympathy, curiosity, affection, jealousy, or intrigue command our attention to a greater degree than events or items than conjure a less affective response (Pekrun, 1992). This is not to suggest that teachers should whip their students into an emotional frenzy for the sake of a little extra attention. Subtle emotional cues such as eye contact, facial expressions, proximity, curiosity, challenge, irony, or humor can be all that's needed to shepherd a chunk from a student's sensory register into a student's *conscious attention.*

Final thoughts on conscious attention. Using the strategies of invitation, discrepancy, and emotional hook, a teacher *can* command students' conscious attention at any time. This does not suggest, however, that a teacher *should* seek students' focused attention throughout the school day. In fact, that would be impossible. Much of the struggle that some teachers seem to have with student attention springs from an expectation that they should obtain it and keep it throughout much or all of the instructional day. A more successful approach seeks a balance among at least three types of student attention (Rutherford, 2001).

Focused attention. Using invitation, discrepancy, and emotional hook, a teacher can seek all students' focused attention on a specific event or task. It is difficult to sustain this kind of focused attention so teachers do well to seek it in short spurts and at choice times throughout the day.

Dispersed attention. It is natural for students to pay attention to various learning tasks and events as directed by their own interests and choices. This type of attention can be sustained for longer periods of time. All students are attending, but to different targets and in different ways.

Inward attention. Students should also have ample opportunities to turn their attention inward through reflection, meta-cognition, self-awareness , and individual preparation or closure.

Theme 8: Chunking

Definition. The ability of the teacher to segment the curriculum and learning activities into manageable portions to avoid overwhelming students' capacity for new information.

Elaboration. According to information processing theory, we have a limited capacity to consciously handle incoming information (Cowan, 1997). Rather than being able to attend to an unlimited number of items simultaneously, we can attend to only a few. While this might seem like an unfortunate design flaw in human memory, it is actually necessary to give us our powers of focus and attention. Adults have a larger capacity than children, but it is still limited (Miller, 1956). Our capacity to consider incoming information is limited to a handful of chunks. A chunk can be thought of as a discrete "package" of information. Chunks can be small like the number 5 or large, like a telephone number- 704-825-8562. Chunks can be simple like the definition of "previous", or complex, like how to drive a car from a stop sign up an icy hill with a manual transmission. Whether our chunks are large or small, simple or complex, we seem to have only about seven of them available to us at any given moment (Miller, 1956; Simon, 1974). Chunking, then, is the process of combining small chunks into larger ones and building the complexity and sophistication of chunks to increase the quantity and quality of learning.

A working memory overload (WMO) is a state of rapid forgetting induced by a task that exceeds the capacity of working memory. As teachers seek to avoid WMOs for their students, they do well to remember the two limiting factors of working memory.

Working memory has a limited capacity. Adults have a working memory capacity of approximately seven discrete chunks (Miller, 1956). Since we hardly ever seek to concentrate on completely discreet chunks simultaneously, it is more helpful to consider that adults can manage three or four representations, or collections of discreet chucks at once (Cowen, 1997). Children have a smaller capacity (Ross-Sheehy, Oakes, & Luck, 2003), perhaps managing one or two representations, rather than three or four for adults (Barner, Thalwitz, Wood, Yang, & Carey, 2007; Moher, Tuerk, & Feigenson, 2012).

Keeping this limitation in mind, teachers would do well to keep new information demands at or below the working memory capacity of their students. For example, a first grade teacher knows not to give multiple step directions to students. This would exceed capacity and lead to an overload.

It is important to help students to combine and consolidate information. For example, through several rounds of practice, a teacher could help students see the four steps in long division as one process, rather than four discrete steps. This process of increasing the size and complexity of chunks is what allows students, even young ones with limited working memory capacity, to build rich understandings and meaningful connections among disparate pieces of information.

Working memory functions as a serial (one at a time) processor. A student's working memory can attend to only one task at a time. Humans can switch back and forth between tasks rapidly, appearing to be multi-tasking, but at any given split second, they are handling just one mental task at a time (Sternberg, 1966). Again, this is not a so much a limitation on our ability to multi-task, as it is a valuable ability to focus and concentrate on individual tasks.

The fact that humans can only focus on one task at a time doesn't mean we can't have several things in our sphere of attention simultaneously. We must choose, however, which item will be in the foreground, as we relegate all other attentions to the background (Townsend & Fific, 2004). It is a bit like a good juggler can keep several balls in the air while holding onto only one a time. As I am writing this chapter, I'm also waiting for the delivery truck to deliver a package, keeping an eye on our 5 month old puppy, Wilson, and copying some video files from this computer to another. Writing is in the foreground and the rest is in the background. That is, until Wilson barks or I see the delivery truck pull into the driveway. Then, the foreground and background trade places, if just for a moment. The juggler grabs another ball and the one he was holding is now in the air.

As teachers understand this process and its subtleties, they are more capable of orchestrating a classroom environment that limits giving students multiple foreground tasks simultaneously. It is difficult for students to listen *and* take notes, to finish their homework *and* listen to the afternoon announcements, or to follow along as text is read aloud *and* spot descriptive words.

Students also benefit when their teachers appreciate some of the nuance of foreground/background attention. Some of the most productive classrooms have multiple processes going on at the same time; group work, individual work, soft music playing, teachers holding conversations with individual students, centers, clean-up, and so on. The trick is to help students keep the foreground in focus and not let the background steal the show too often.

An understanding of serial processing can also benefit behavior management. Rather than asking students to not do something or to stop doing something, ask them to do something else. The brain can't focus on both so the new behavior displaces the old one. Instead of saying "Thomas, please stop talking." A teacher might say "Thomas, will you use your left pinkie finger to point to the picture of the elephant on page 45?" If Thomas complies, he must, at least temporarily, stop talking.

Because of serial processing it is difficult for us to *not* do something. Have you ever tried to not smile, or not giggle in church, or not touch a button? If you're a golfer you know how hard it is to *not* hit it in the pond. Our youngest son, Bennett, was a serial milk spiller as a toddler. I remember it didn't help much to say "Bennett, don't spill your milk." It was more effective to say "Bennett, hold on with both hands." So we humans can't focus on many things at once, but we also can't focus on nothing.

Theme 9: Connection

Definition. The ability of the teacher to establish a mental link between the intended learning and past learning or experiences.

Elaboration. Of all the twenty-three themes, Connection is perhaps the single theme that is most directly aimed at how the human brain naturally learns (Bartlett, 1932). We know that as we learn, the brain is constantly seeking to connect things, to look for patterns, to see similarities, and to form familiar categories (Caine & Caine, 1994). Whenever we encounter something new, it is natural for us to think of past knowledge or experience that is similar (Tse, Langston, Kakeyama, Bethus, Spooner, Wood, Witter, & Morris, 2007). As we describe a new food to a friend, we might say "it tastes like chicken." To describe a new puppy, we might say "he looks like a cross between a poodle and a beagle." If someone is giving us directions, they might say "it's a half mile past that big red barn on the right." In all these examples, we are building on what the brain already knows or has experienced. Since we know what chicken tastes like, what poodles look like, and where the red barn is, we can build on our past knowledge and experience to quickly and effectively learn new things.

Teachers who recognize this natural process, and capitalize on it, are teaching in a way that is congruent to the brain's innate tendencies (Nummela and Rosengren, 1986). The social studies teacher who suggests that the three branches of the federal government operate a lot like the game paper-rock-scissors is using connection. The science teacher who explains to 9th graders that molecules in the liquid phase move just like students in a crowded hallway during a class change is using connection. In the 1984 movie *The Karate Kid*, Mr. Miyagi used connection when he taught Daniel to wax his car. Remember "wax on (clockwise rotation) – wax off (counter-closkwise)". Mr. Myagi used those movements as a connection the next day when he taught Daniel how to block incoming punches from the right (wax on) and from the left (wax off).

Connection is a powerful tool, but it is wise to remember that it can work both for and against learning (Rosenfeld, 1988). When the learner connects new information to prior knowledge or experience and the connection enhances the learning of the new material, then connection's effect is positive toward the intended learning. But when the learner connects new information to prior knowledge or experience that does not produce the intended learning, then the connection's effect is negative (Nummela and Rosengren, 1986). We might call this a missed connection or a misconception.

Many students have a misconception about what causes the Earth's seasons. Remembering past experiences with fire, they recall that it is warmer close to the fire and colder farther away. They then mistakenly connect that relationship to their understanding of the Earth's seasons, believing that summer is when the Earth is closer to the sun and winter is when the Earth is farther away. The truth is that seasons are caused by the Earth's 23.5° degree tilt on its axis. As the Earth revolves around the Sun the northern hemisphere tilts toward the sun in the summer and away in the winter. It's this tilting toward and away from the sun that causes the seasons, not the distance from the sun.

Some common causes of misconceptions.

Lack of processing time. When students are asked to learn much new material in a short time, with few opportunities for processing, the tendency is to make the *first* available connection, rather than to think through the possibilities and make the *best* available connection. If a person is asked to repeat the word "white" ten times and then is quickly asked the question "What do cows drink? They will often respond "milk." That's not the best answer, but it is the next and fastest connection among the terms white, cow, and drink. If we were to try that activity and add the command "think about it for 10 seconds before you reply," most people would then answer, "Cows drink water." The extra processing time gave the brain a chance to move beyond the first possible connection and select a better alternative.

Oversimplification. To teach is to simplify. Great teachers can take very complex content and make it accessible, even to beginning learners. But taken too far, simplification can lead to misconception. Photosynthesis is a complex chemical process. To simplify it, a teacher might say "Photosynthesis is the process by which plants eat food for energy." That's a tempting connection. Students know how humans eat food and know how digestion works to turn food into energy. But, it's an oversimplification. Plants don't eat, chew, swallow, digest, or excrete. Using the terms "food" and "eat" will likely get in the way of learning the real chemical process of photosynthesis.

Teaching in two dimensions. If a learner's first experience with a three-dimensional reality is a two-dimensional representation of that reality, the possibility for misconception is greater (Goldberg & McDermott, 1987). Many students learn about the moon's phases from a textbook with pictures (2-D) of a full, half, quarter, and crescent moon. This can lead to all sorts of explanations of the moon's phases. A teacher does better to hang a volleyball from the ceiling, turn off the lights, and use a flashlight (standing in for the sun) to show how half the moon is always light and half is always dark. Then by moving around the moon (the volleyball) they can see that phases are due to their location as they look at the half light/half dark moon.

Some students believe that Hawaii is located about 45 miles southwest of San Diego, CA. That's where the 2-D map places it to save space. If the student learned the location of Hawaii from a globe, the misconception would be unlikely. It is important that initial experiences with three dimensional reality be in three dimensions.

Tips or making connections and avoiding misconceptions.

The connection must first exist in the mind of the learner. If there is any doubt about this, it is a good idea for the teacher to first provide the knowledge/experience to be connected to and *then* execute the connection.

The connection should be made actively. Each individual student should engage in the connection, not just watch as other students participate. Classroom demonstrations, where one person does something and the rest observe, can be useful, but are not the best strategy for making and remembering connections.

Watch for, and test for, misconceptions. Since connection is an invisible process, the teacher can only hope that the right links are being made. It is best to assume that there will be misconceptions and to predict where they are most likely to occur. When the likelihood of a misconception is high, consider adding processing time, check for oversimplification, and be sure to teach three dimensional content in three dimensions.

Theme 10: Practice

Definition. The ability of the teacher to improve recall and application of learning through effective rehearsal, repeated effort, drill, repetition, study, and review.

Elaboration. The famous joke goes, "How do you get to Carnegie Hall?" The punch line, "Practice. Practice. Practice." Practice has long been recognized as an essential element in learning. In reflecting on thousands of classroom observations, I would say, as a roough estimate, that 50% of all classroom time is devoted to practicing things. Great teaching is not simply the presentation of new material in an interesting, relevant manner. It involves designing quality experiences for students such that, as they engage in the experiences, they work out their mastery of the curriculum (Schlechty, 2011). An important part of the design for this "working out" of students' mastery is the design for quality practice. Call it repetition, drill, rehearsal, review, study, or practice. By any name, a key effect of practice is that knowledge and skills become established in long term memory so that recall and application can occur in the future (Atkinson and Shifflin, 1971).

Based on numerous observations of classroom instruction, interviews with coaches, band directors, drama teachers, and others who routinely design practice sessions, and a thorough scan of the literature on the topic, here are some success principles that can serve as a guide to designing and facilitating productive practice.

Success principles for practice.

Keep practice sessions short so focus and intensity can remain high. The key to productive practice is focus, intention, motivation, and intensity (Ericsson, 2007), not just the amount of practice or the length of time one practices. Long sessions of mindless, low intensity practice can even serve to reduce recall and application (Hunter, 1982).

A lesson can be learned from watching the practice of elite athletes and musicians. To reach their high level of performance they must accumulate many, many hours of practice. Their daily routine, however, finds them practicing for many short, intense spurts distributed across time. K. Anders Ericsson (2007), in his study of elite performers found that expert violinists, for example, accumulated over 10,000 hours of deliberate practice to reach virtuoso status. Deliberate practice, according to Ericsson, is exhausting and intense and therefore cannot be performed for long periods of time.

Practice small chunks, then, move to larger combinations. Human short term memory has a limited capacity (Miller, 1956) and practice sessions are more productive when the amount of material to be practiced is limited. Once recall of the smaller chunks is achieved, they can be combined to form more elaborate organizations. (Atkinson and Shiffrin, 1971; Hunter, 1982). For example, an organist might practice the left hand in a piece, then the right hand, then the foot pedals, then put the parts together to form the entire performance.

Attend to energy and motivation needs during practice. Practice requires energy. Focused, intense practice requires even more energy. Energy can be increased by introducing games, goals, incentives, encouragement and feedback (Ericsson, 2009).

Provide knowledgeable feedback during practice. Practice sessions are most productive when students are provided abundant, immediate, and specific feedback on their work (Hattie & Timperley, 2007). High quality feedback encourages students to persist in the practice activities.

Move quickly to elaborative practice. It is easier to remember items if we know more about them, beyond their definition, spelling, or representation. The more students can make connections among ideas and concepts and associate them with other items from prior learning and experience, the more likely they are to be remembered and applied (Raaijmakers and Shifflin, 1981) (Smith, 1979).

Conduct practice in the visual, spatial, and cognitive domains. Recall is enhanced when students are asked to engage using both internal (cognitive) and external (visual and spatial) processing methodologies (Tigner, 1999). The regions of the brain that process and remember images and spatial relationships are well developed in humans and can be important aids for remembering more cognitive or abstract items (Awh, Jonides & Reuter-Lorenz, 1998).

Distribute practice sessions across time. Recall is enhanced when the brain has an opportunity to consolidate memories before adding new ones. Also, the periodic revisiting of a memory strengthens it and increases the ability to recall it in the future. Therefore, cramming for an exam is much less productive than reviewing for it over a period of days or weeks (Baddeley, 1986).

Design the difficulty of the practice to be challenging, but attainable. Motivation to engage in practice is weak if the task to be practiced is viewed as too easy or too hard. Motivation is strongest when the task is viewed as challenging, but within the capabilities of the student. Optimally, the task difficulty of the practice increases in step with skill development, maintaining the learner in the zone where challenge and ability overlap (Vygotsky, 1978).

Theme 11: Personal Relevance

Definition. The ability of the teacher to embed the intended curriculum into issues and contexts that are linked to students' personal lives, survival instincts, or immediate well-being.

Elaboration. Students engage deeply and learn quickly when the curriculum is embedded in issues and contexts that students see as linked to themselves (Sylwester, 1995; Wolfe, 2010). This enhanced engagement and learning is further strengthened if the link is to the students' survival instincts or immediate wellbeing (Damasio, 1994). Human beings, it seems, are particularly interested in themselves and especially in their own survival and immediate well-being. Teachers can use this feature of human nature to their advantage (Wolfe, 2010). After watching many teachers, who are naturally gifted at this, work with students, I think I've figured out how they do it. Here's how it seems to work. First, they select an issue or context that is personally relevant to students. Then, they use it as a "container" to hold the intended curriculum. The trick is to get students' brains to see and engage with the container (something personally relevant) and, in so doing, to also engage with the contents of the container, the curriculum.

We have an old dog at our house. His name is Berkley. Berkley does not like to take pills. I've tried to reason with Berkley about taking the pills. It does not seem to matter to him that the pills are good for him and that if he takes them, he will feel better. Berkley's favorite food is cheese. He absolutely loves it and his tail starts wagging the second he believes there may be some cheese in his near future. So, to get him to take the pills, I have to use the cheese as a "container." He wolfs down the cheese, and in so doing, gets the benefit of the pills.

Talented teachers operate similarly. Instead of reasoning with students that they should pay attention to the curriculum because it will benefit them in the future, they find some "cheese," wrap the intended content into the cheese, and then watch the students gobble it all down.

A kindergarten teacher begins letter formation with the letters contained in students' first names, not in ABC order. Students work hard and long on forming these "special" letters.

A middle school art teacher teaches "proportionality" by printing an image of each student's face on graph paper. He then asks students to sketch an enlarged image onto another sheet of blank graph paper. No one makes a peep as the students focus on recreating their own faces.

A 9th grade English teacher asks students to translate passages of Shakespeare's *Romeo and Juliet* from Elizabethan language into "Tweets" of 140 or fewer characters. As they translate, the students become engrossed in the true meaning of Shakespeare's words so they can accurately recreate the sentiments in Twitter language.

A high school biology teacher introduces basic genetics by asking students to create a personal genetic profile including eye color, closed or open ear folds, widow's peak vs. straight hairlines, and length of index vs. ring fingers. Students are riveted on the lesson as they learn more and more about themselves and their inherited traits.

In each case, the teacher employed a similar approach. Instead of simply teaching the content directly, the teacher first selected a personally relevant "container" for the content. Then, the teacher carefully selected the content that would be a particularly good fit for the container. The sequence of the process is important. Choosing the personally relevant container comes first, not the selection of the content.

So, using personal relevance is not so much asking oneself, "How can I make this content personally relevant?" It is, rather, asking oneself, "What is already personally relevant?" And then, once that question has been answered, asking "What content is a particularly good fit for this specific container." The better the fit, the less likely the students' brains are to see the scheme and resist it.

There is one personally relevant issue that merits special mention, because it is such a dependably successful container for so many different types of content. It is called *fun*. Here's how fun works. When teachers design learning experiences that not only produce content mastery, but are also fun, they are partnering with a powerful ally. Inside the human brain, fun is not just fun. Fun is survival linked. The human brain is designed to master quickly and remember well anything that is linked to personal survival (LeDoux, 1996, 2003). Fun is linked, very linked. So, when teachers make a learning experience fun, they are strategically increasing retention and transfer, and decreasing the need for review and re-teaching. Fun makes for more efficient and more memorable learning. Fun is survival linked and survival drives human attention and deep learning. Fun is not just fun. Fun is also cheese (Rutherford, 2009c).

Recently I was watching a high school Spanish teacher conduct a lesson on grammar. It was the day after Valentine's Day. She organized the class into teams and asked each team to submit a Valentine's Day card with an original, romantic metaphor in Spanish. Each team then shared their work and the class voted on the best romantic line. It was hilarious! They reacted to each effort with applause or groans. The winner was, "On the highway of love, you have a lot of curves and I have no brakes." What fun! Make no mistake; they were getting the grammar right. The fun made it faster, easier, and more memorable (Rutherford, 2009c).

Theme 12: Locale Memory

Definition. The ability of the teacher to enhance learning by organizing information around the learner's position or "locale" in three-dimensional space.

Elaboration. Memory is enhanced when concepts, skills, or information is encountered in a relational manner, not as a series of unrelated or disconnected facts (Cohen and Eichenbaum, 1993). Human beings are endowed with an innate and powerful ability to function in and navigate through the natural, physical world (O'Keefe and Nadal, 1978). As a part of our survival apparatus, we can remember how to get home, where that bee's nest is (to avoid a sting), where the coffee is to be found in the grocery store, or how to play hop-scotch. When we lose our car keys, we retrace our steps to find them. We might say to a friend, "watch your six," invoking the layout of a clock face to suggest he keep an eye on who's behind him.

When classroom information is presented in a physical, spatial context, this innate navigational ability is tapped to the great benefit of recall and transfer of learning. (Caine and Caine, 1994).

A math teacher who constructs a large scale version of the X-Y coordinate plane on the gym floor and then asks students to stand in quadrant II is invoking locale memory.

A science teacher who lays out the planets' relative distances from the sun on the football field, showing that Jupiter is many, many times farther from the sun than the Earth, is using locale memory.

A history teacher who walks students down the timeline of World War II, constructed in the hallway with tape and sticky-notes, is teaching to students' local memory systems.

When a student looks at her right hand, palm up, and remembers where key cities are in the state of Michigan, she is using her locale memory system.

A fifth grade teacher uses locale memory as she takes students outside to the 36' x 48' United States map that the PTO painted on the school playground. The teacher asks students to use chunky blue chalk to draw in the major rivers. When all the students are finished, each group has to "walk" the entire class down their river, identify the states they pass, and share other facts about the river.

A Spanish teacher uses locale memory by linking vocabularly words to a scavenger hunt. He divided the class into groups of three and gave each group a starting clue. The clues were in Spanish and sent the students to various locations and people around the school. Some clues led them to inside an empty locker, under the school mascot, above the visitor sign in the lobby, etc. Other clues involved school personnel such as the school nurse. When the students went to the person, they received another clue that instructed them to sing, jump, bark, or some other action before they could receive the next location clue. All the clues eventually led the students back to the classroom for the scavenger prize… a dish of flan. As the students enjoyed the treat they were complaining and laughing about the places they went and actions they performed, such as: Cante Centelleo, Centelleo, Estrella Pequeña para el secretario.

A high school Physics teacher uses locale memory to review Newton's laws of motion, center of gravity, momentum, rotational inertia, torque, and the coefficient of sliding friction. The teacher takes the students to a nearby elementary school playground. The swings, slide, monkey bars, jump rope, and balls are the instructional materials. As the students interact with the playground equipment, the teacher reviews applicable physics laws. The following day, student groups make a poster of an assigned playground item. On the poster, they record the physic laws that were demonstrated at the playground. Throughout the semester, the teacher often refers back to the playground adventure, "Remember when you…"

Information that is not anchored to a physical, spatial context takes more time to learn, requires frequent rehearsal to keep it current, and must be limited to small amounts. Great amounts of information can be stored in locale memory. It can be quickly learned and requires little review to maintain access (Caine and Caine, 1994).

Theme 13: Mental Models

Definition. The ability of the teacher to provide a memorable structure that organizes, clarifies, and improves recall of the content being taught.

Elaboration. Mental models support the learner's need to clarify and position the content in memory for recall. Venn diagrams, T-charts, and bubble maps are mental models. Songs, stories, jingles, rhythms, and sayings are mental models. Smells, sounds, textures, and tastes are mental models (Mastropieri & Scruggs, 1998).

The neuroscience behind mental models points to the role of hemisphericity, the difference in the way the two brain hemispheres process information (Ali & Kor, 2007). It is an oversimplification of the brain's structure and function to exclusively assign specific learning tasks to either hemisphere. As a general guide, however, consider that the left hemisphere tends to process text, language, logic, and symbols while the right hemisphere tends to process images, intuition, emotions, and sensory input (Springer & Deutsch, 1993). Mental models enhance clarity and recall by associating a right hemisphere process (for example- the colors of the rainbow) with a left hemisphere process (for example the text-ROY G BIV). The two processes together provide an architecture for the brain to better consider, and remember, the intended content (Boyle & Weishaar, 1997; McCarthy, 1987). Useful mental models should help the learner clarify the content as well as remember it. Notice that the mental model ROY G BIV not only provides a way to remember the colors of the rainbow (Red, Orange, Yellow, Green, Blue, Indigo, Violet), but also adds clarity to the content by listing them from longer to shorter wavelength in the same sequence, left to right, that the colors appear in nature.

Visual mental models are particularly effective when used to increase comprehension of text. Robert Marzano (2007) and David Hyerle (1996) point out that classroom learning is enhanced with the use of visual representations. Marzano, Pickering, & Pollock (2001) call these types of mental models non linguistic organizers. Pairing a text (linguistic) item with a visual (non linguistic) structure creates a memorable structure on which learners can assemble and recall information (Larkin & Simon,1987).

Mental models are also constructed by linking sensory representations (right hemisphere processing of sights, sounds, textures, smells, or tastes) to symbol systems (left hemisphere processing of letters, words, numerals, or > < ? + % ∞ ° $A = \pi r^2$) (Arcavi, 1994; Ghazanfar & Schroeder, 2006). Teachers of young children often ask them to trace the letter b on the sand table as they say it. This creates a powerful processing link between the two hemispheres. A music teacher might write these terms for tempo on the board: allegretto (moderately fast), allegro (brisk or rapid), and presto (very fast). Then the teacher might provide an audible structure by singing the letters of the term allegretto moderately fast, the letters of allegro briskly, and the letters of presto very fast.

Some of the most powerful mental models link left and right hemisphere processing, or ways of thinking. A Geometry teacher might ask students to predict which geometric solid, a cone or a pyramid, has the greatest volume. Predicting, or identifying a hunch or guess, is mostly right hemisphere thinking. Then, the students fill the shapes with colored water to see which holds the most. The process of measuring and recording the actual volume in milliliters is a left hemisphere process.

An art teacher might, before the students begin their two-week paper mache project, ask them to examine several completed projects from last year. The left hemisphere processes the sequence of steps in the project while the right hemisphere processes the gestalt of the finished projects.

Mental models are found extensively in children's literature. Notice, in a well illustrated book for young children, how the text and the illustrations are often close together or even superimposed. The images provide a structure to which the simple words can attach.

Mental models are evident in the field of advertising. Well-crafted logos, jingles, and tag lines create memorable associations with products, services and brands.

Mental models are often used effectively in wise sayings, idioms, proverbs, or parables. Visual or symbolic imagery makes it easier to pass on wisdom from one generation to the next as illustated in these sayings: "A bird in the hand is worth two in the bush" and "The early bird gets the worm."

Teachers who employ a wide variety of mental models will likely find the theme Locale Memory (Theme 12) to be an effective complement. Locale memory is, essentially, a mental model that is constructed in the physical domain instead of the cognitive domain. A Venn Diagram, for instance, can provide an effective structure for organizing similarities and differences. In order of increasing impact from the physical domain, the Venn Diagram can be made of two, partially overlapping circles on a piece of notebook paper, big circles on a piece of poster paper, two hula hoops overlapping on the floor, or two big circles drawn with paint on the playground. Each increase in scale increases the positive contributions of spatial, or locale memory (Caine & Caine, 1994).

Theme 14: First Time Learning

Definition. The ability of the teacher to capitalize on the brain's tendency to attend to, process deeply, and remember well, learning it regards as new, original, or novel.

Elaboration. First impressions stick with us. Do you remember your first memories of the ocean, or the Rocky Mountains, or ice cream? How about your first car, your first crush, or your first ride on the tilt-a-whirl? There is something about initial experiences that just has more staying power in our memories. This staying power can work for us or against us. If we learn to factor binomial equations well the first time through (remember FOIL- first, outside, inside, last) it sticks with us, but if we learn someone's name incorrectly when we first meet them, we might always have trouble recalling their correct name.

First time learning also influences our attitude about various activities (Martin & Clore, 2001). If our first camping trip was a lot of fun, we might go again and even become avid campers. If our first experience was just insects, rain, and boredom, then we'll probably opt for a hotel.

Teachers who are adept at corralling the memory effects of first time learning understand that these effects cannot be turned on or off at the teacher's discretion. They just happen. They happen whenever a learner's brain encounters something for the first time, whether the teacher is ready for it or not. In some ways employing first time learning starts with anticipating it, planning for it, or at least not being surprised by it.

The experiential and anecdotal evidence that supports the presence of a first time learning effect is substantial. We've all experienced these effects and can recall examples from our own learning and from our experiences teaching others. The cognitive science behind first time learning is still emerging, but these three explanatory approaches appear to lead the way, each with a slightly different emphasis.

First time learning as a survival function. This approach maintains that the primary function of the human brain is to maximize the probability of survival in the surrounding environment. The brain loves music, a good sitcom, and conversation with engaging friends, but its primary function is survival, to get us to the next few moments of life. New experiences then are extraordinarily pertinent to this function. When exposed to a situation we've seen before, the brain knows how to respond since it has experienced the situation and has some history to draw from as to how to survive, or even capitalize on the event. When the brain encounters something new, not possessing a reference pattern, it pays rapt attention to the new information or experience to quickly assess its importance and whether it has positive, negative, or neutral implications for survival. It is this rapt attention and the emotional responses that accompany it that drives the positive memory and learning effects we see with first time learning (Cahill, Gorski & Le, 2003).

It may seem odd to consider that students' brains are on survival watch while they are at school. I suppose some classrooms might possibly bore someone to death. But, other than the occasional hallway fight, is there really a serious question of survival in the classroom? Evolutionary biologists would remind us that we all engage in a 21st century life using brains that evolved over millennia to aid our survival in a very different environment (Caine & Caine, 1994). When a teacher says "Today we'll learn a brand new term for an important element of writing. I'll bet you've never even heard this word before. It's called onomatopoeia," the students' brains react just as their ancient, hunter-gatherer ancestors' brains reacted to the discovery of a tasty new fruit- examining it with full attention to determine whether it might be nourishing or poisonous.

First time learning as a function of imprinting. Imprinting, in the natural world, refers to the attachment an animal makes in the early moments of its life to its parents or the first reasonably similar object it encounters (Bateson, 2003) (Hess, 1973). A compelling example of this is documented in the 1996 movie *Fly Away Home.* The movie, which was inspired by a true story, documents the lives of a flock of orphaned Canadian Geese who imprint upon the young girl who cares for them. She uses an ultra-light airplane to teach them how to fly south for the winter.

Imprinting is the biological correlate of a cognitive process called assimilation (Sluckin, 1965). In assimilation, the brain uses new information to construct a sort of mental architecture on which subsequent learning can be attached. In both cases, these powerful early memory effects are associated with early experiences or initial learning. Just as described in the previous section on first time learning as a survival function, there appears to be extra attention paid to first or early experiences. This extra attention and memory serves as a sort of category heading to which future learning and experience can be associated (Bhattacharya & Han, 2001).

First time learning as a function of primacy and recency effects. Perhaps one of the aspects of first time learning that has been best documented is the ability of the brain to better recall items that are learned first in a series (primacy effect) or last (recency effect). Conversely, the hardest to remember items in a list tend to be found in the middle of the sequence, where neither primacy nor recency work to enhance memory (Sousa, 2011). It is more likely that the average person can remember the first two presidents and the last two presidents than the 23rd president (Benjamin Harrison). The first presidents occupy a "category heading" in our minds with which subsequent presidents are associated, but probably not remembered. The last presidents are remembered because it is easier to remember things that happened recently and also because these presidents are likely to be more directly relevant to our lives. Again, first place counts for recall.

As teachers plan for first time learning, they can maximize the positive effects by focusing on these four instructional criteria:

Accuracy. Since first time learning will yield long-lasting memories , it is important to get it right the first time. Spell words correctly the first time they are presented. Pronounce them correctly. Provide the correct definition and usage. If teaching the tennis backhand stroke, show the correct form first, not common errors.

A teacher should not begin instruction on the correct use of semicolons by asking students to correct sentences where they are misused. The teacher who works a complex math problem a few times the night before to be sure it is right ensures positive first time learning.

This is not to say that students can't benefit from discovery learning or inquiry learning, where the "right" answer is elusive at first. Just be careful to watch for negative first time learning and be sure that students grasp the concept accurately before the cement dries.

Completeness. Introduce first time learning content when there is sufficient time and energy to provide a successful first experience (Bransford, Brown, & Cocking, 2000). New concepts should not be introduced during the last few minutes before the end of the school day, or just before lunch, or as a time filler between other scheduled activities. Teach first time learning in prime time, when interruptions are less likely and minds are fresh.

Also, it is important to bring closure to a first time learning experience at a strategic point, not just when time runs out. A useful analogy is found in culinary arts class where the teacher must be sure to end the lesson at a strategic time when the food can "keep" overnight. There are similar points in all academic lessons where the learning can be "kept" overnight and added to later.

Connected to reality. The first day of Mr. Sullivan's 9th grade woodworking class is spent at the local lumberyard, not in class. He wants to ensure that the first time his students hear the term "4x8 sheet of plywood," they are actually looking at one and examining the layers of wood that are called plies.

The context of initial learning is important (Bransford, et al. 2000). As a general rule for first time learning, don't use representations of reality when actual reality is available. A diagram of a microscope produces poorer first time learning than an actual microscope. A video of a raccoon is better for first time learning than a drawing of a raccoon, but not nearly as memorable as a live raccoon.

Interestingly, representations of reality can be very productive and efficient for subsequent experiences, after an initial experience that is closely linked to reality. That diagram of a microscope makes perfect sense after the student has had a quality first experience with a real microscope. So, the sequence is important. It's reality first, then representations of reality following.

Different from subsequent lessons. Initial learning is most memorable when it is presented in a substantially different form than the following experiences. The purpose of an effective introduction to new material is to create a memorable experience that sets the stage for subsequent experiences (Gagne, Briggs, & Wagner, 1992). It need not, and probably shouldn't, seek to teach all the detail or ask students to engage in repetitive rehearsal activities.

A language arts teacher might ask a parent who is a terrific story teller to dress in costume and read the class a riveting story and record the story on video. After the story, the teacher might ask students to identify what made the story so easy to listen to, funny, and memorable. Recording the responses on a flip chart, she might then circle some of their comments and label the responses with the term hyperbole. The teacher could then replay segments of the story and ask students to identify other instances of hyperbole and note when the laughter was loudest. Notice that the introductory lesson is more elaborate than later lessons on hyperbole need be. The teacher, recognizing that this is a first time learning moment, created an experience that was accurate, complete, connected to reality, and substantially different from lessons that will follow. Introductory lessons are good investments of extra planning time, materials, and classroom energy.

Theme 15: Neural Downshifting

Definition. The ability of the teacher to prevent "survival mode" thinking by eliminating physical threats, psychological threats, and situations where students feel helpless or out of control.

Elaboration. Neural downshifting refers to the negative effects of threat and stress on human thinking and learning. This phenomenon is sometimes called fight or flight response, threat response, or survival mode thinking.

The term "neural downshifting" was first used by Leslie Hart in his 1983 book, *Human Brain and Human Learning*. Hart writes, "Thus we have the phenomenon, readily observable in ourselves and others, including students, that I have called 'downshifting.' When the individual detects threat in the immediate situation, full use of the great new cerebral brain is suspended, and faster acting, simpler, brain resources take larger roles" (Hart, 1983, p.108). Hart's understanding and description of neural downshifting is based, in large part, on Paul MacLean's triune brain theory (MacLean, 1978). Triune brain theory suggests that the human brain's thought processes can be understood as the interplay among three progressively newer (in evolutionary terms) brain systems. MacLean refers to the oldest brain structures as reptilian, the next, newer systems as old mammalian, and the newest as new mammalian (1978). Downshifting then, is the threat induced *shifting* of thought from the rational, creative new mammalian structures of the brain down to the faster, but simpler structures below.

New technologies and new research over the decades since MacLean's work have provided a vastly richer picture of the brain's neurophysiology and MacLean's triune brain theory has received both notoriety and criticism over the years (Cory & Gardner, 2002; Pinker, 2002; Reiner, 1990). Placing the paleocerebral arguments aside, the essential insight that the human brain operates optimally in an environment free from threat and undue stress has endured, and in fact has been reconfirmed (Caine and Caine, 1994; Damasio, 1994; LeDoux, 1996; Jenson, 2008).

In the classroom, downshifted thinking is characterized by rote memorization, reflexive responses, and unoriginal approaches. Upshifted thinking is characterized by creativity, analysis, cooperation, pattern recognition, and insight (Caine & Caine, 1994; Hart, 1983).

Unlike the other twenty-two Artisan themes, neural downshifting refers to something that is to be avoided in the classroom. A teacher who understands the effects of neural downshifting and the environmental triggers which cause neural downshifting, can take steps to prevent it from occurring.

Three environmental triggers of neural downshifting.

Downshifting will occur in the presence of a *physical threat* (Hart, 1983). Certainly, fighting and bullying cause downshifting. So, also, do other less obvious physical factors such as overcrowding, hunger, thirst, confinement, fever, exhaustion, and being too hot or too cold. Teachers do well to examine their classroom's physical environment and eliminate physically threatening situations.

Downshifting will occur in the presence of *social or emotional threats* (Jenson, 2008). The old saying "sticks and stones may break my bones, but words will never hurt me" may be true in a purely physical sense, but words, or any other social or emotional threat cause the same downshifting response as do physical threats. Teachers do well to examine their classroom's social and emotional characteristics and remove threats. Being wrong in public, forced competition, time constraints, fear of recognition, fear of social blunders, and overt comparisons among students are all examples of social and emotional downshifters.

Downshifting will occur in the presence of *helplessness or loss of control* (Caine & Caine, 1994). This is perhaps the most subtle, but pernicious, cause of classroom downshifting. It seems that the brain will downshift into safe mode when it perceives that it is out of control of the immediate situation. Firefighters, police officers, and emergency room doctors score high on job stress measures. Studies have shown that the stress levels of co-pilots often exceed that of pilots and that middle managers suffer more stress than CEO's. Why is this? The common thread that runs through these examples is that they are all high stakes-low control occupations. It is interesting that in the above occupations, training is emphasized. This makes sense. While downshifted, as one would be in a house fire or a police shootout, one cannot create new, original approaches, but must fall back on learned and practiced responses.

One, almost universally effective antidote to loss of control downshifting is *choice.* When teachers provide students with options, choices, and personal decisions, their sense of ownership and control is increased and downshifting is reduced.

It is important to note that neural downshifting is not a phenomenon that affects students only. Teachers and administrators, when confronted with physical, social, or loss of control triggers, will suffer neural downshifting too. It is hard to imagine a school where downshifted adults can dependably create upshifted environments for students.

Theme 16: Enriched Environments

Definition. The ability of the teacher to shape the physical and social environment of the classroom to enhance learning.

Elaboration. One of the most exciting scientific discoveries of the past 50 years, and one with significant implications for educators, is that the human brain does not contain a fixed number of brain cells, but rather, can generate new neurons and new connections among neurons throughout our lifespan (Diamond, 1984). Neural plasticity, the ability of the brain to change its physical form and function to match the needs of the environment (Van Pragg, Kemermann, & Gage, 2000) provides the foundation for this consideration of classroom environments, and how they might affect, for better or worse, the learning and achievement of students.

The scientific examination of the effects of environmental enrichment on the human brain and human learning is still incomplete. Much is not known about exactly which environmental conditions are responsible for specific brain changes or when, in the lifespan, these changes are most pronounced, or if, and how, these brain changes affect human intelligence, learning, and school achievement (Huttenlocher, 2002). Still, the exciting brain research on neural plasticity and the effects of enriched environments provide some broad insights into how enriched environments work (Diamond, 1984) and how teachers might design classroom environments for the benefit of students and their learning.

Much of the research on the brain effects of enriched and impoverished environments has been conducted by placing groups of rats in environments with different characteristics and then looking at the rat's brains to see what, if any, effects are evident (Huttenlocher, 2002). The environmental characteristics most consistently associated with positive brain effects were (Diamond, 1984; Diamond, Johnson & Ingham, 1971):

- Rats were placed in larger cages with more rats in each cage. This increased the amount and complexity of the social relationships among the rats.
- The physical environment was changed frequently with new toys, new layouts, and new opportunities to engage with the environment. This

"periodic novelty" increased the learning required for rats to engage with the environment.

- The environment encouraged increased physical activity by providing running wheels, tunnels, ladders, and space to move. This increased the overall physical activity of rats as compared to the control group.

Informed by thousands of classroom observations, and in keeping with the three broad themes of environmental enrichment from the rat studies (social complexity, novel physical environment, and increased physical activity), here are some guidelines for creating enriched classroom environments. Note that enriching elements are found in both the physical environment and in the social environment of the classroom.

Physical characteristics of an enriched classroom environment.

Opportunities for physical engagement. Classroom environments are more enriched when there are things to do in the classroom, not just places to sit. A place to cast a vote for your favorite adjective, a place to leave a sticky note of positive feedback on others' writing samples, a place to estimate the number of jelly beans in a pickle jar, a place to use yarn and push pins to show connections between Spanish and English terms, a place to quiz yourself on ACT vocabulary words, a place to check your heart rate, do 30 jumping jacks, and then check it again to note the change, a place to check the outside temperature and record the data are all examples of elements that enrich the physical environment of the classroom.

Note that in all cases, there is a physical location designated for the activity, the activity involves some degree of physical action, there is an element of novelty to each activity, and that the activities are relevant to the curriculum.

Periodic changes in the physical environment. Without question, there should be areas of each classroom's physical layout that are consistent throughout the school year. It would be foolish to change the location of the fire drill procedures or to send in a work order to change the location of the classroom sink. And, there is a level of familiarity with the classroom layout that enhances classroom management and reduces stress. Beyond these management considerations, however, there is usefulness in change. Change that creates new requirements for thinking, new sequences to remember, new people with which to interact, new materials to encounter, new media to master, new visual angles to interpret, or new habits to learn cause the brain to adjust and grow to handle the new challenges at hand.

Changes in the physical classroom environment can be simple or subtle and still produce a novel effect. The process can also be systematized. Many teachers create several locations in their classroom that they know will be changed on a regular basis to match the changing curriculum, leaving the rest of the classroom layout to be consistent.

Social characteristics of an enriched classroom environment.

Unconditional positive regard. The term "unconditional positive regard is generally attributed to Carl Rogers, a humanistic psychologist who believed that, during counseling, people experienced more growth in an environment of genuineness, acceptance, and empathy (McLeod, 2007).

On the first day of school, parents everywhere ask their children the same question, "Do you like your teacher?" I have a theory. I believe that when students respond to that question, the question they are really answering is "Does my teacher like me?" As the year progresses, some other relevant questions are answered too. "Is my teacher glad I'm in the class?" "Does my teacher think I'm an important member of the group?" "Would my teacher miss me if I was absent?" "Would my teacher want to be around me if he didn't have to?" When these internal questions are answered mostly in the affirmative, students experience UPR, a powerful enriching element of the classroom environment.

Relaxed alertness. Learning is optimized in an environment of safety and security where the nervous system is relaxed and not overwrought with stress or anxiety. Learning is also optimized when there is internal motivation, interest, heightened awareness, alertness, and energy. When the classroom environment is characterized by both of these states simultaneously, the stage is set for high quality engagement and deeper learning (Caine & Caine, 1994).

Elite athletes often model relaxed alertness in their performances. Usain Bolt, the Jamaican sprinter who, at this writing, holds the world record for the 100m dash at 9.58 seconds, is unquestionably alert and fully engaged as he runs. Look closely though, and you will see that he is also relaxed, calm, and almost serene as he cruises past his competition. He actually seems to be enjoying the experience, rather than fighting the wind for that last tenth of a second.

Michele Wie, a LPGA golfer, also models relaxed alertness. As she addresses the ball for a tee shot, she is smooth and fluid, never jerky or overextended. Somehow, out of that smooth, effortless swing, comes the golf ball exploding through the air for another 300+ yard drive. She is one of the most powerful ball strikers on tour, but also one of the smoothest. She is both at the same time.

In the case of athletes and students, the goal of relaxed alertness is not to create a balance between relaxation and alertness, but rather to have as much of both as possible, to be very relaxed and very alert, simultaneously.

A second-grade teacher moves from station to station, encouraging students to engage in the various reading drills with their best efforts. Music plays in the background and students are smiling, laughing a little, and enjoying the practice work. They are relaxed and alert.

A Spanish II teacher tests and records students' fluency with timed readings. She sets the clock for 60 seconds and says, "Go." Students read as quickly as they can, but with fluency and expression. They don't panic when they come to a difficult word, but simply do their best and move on. Before each trial the teacher encourages students to relax and breathe naturally. "You'll do better, if you're conversational and at ease." She assures the students that they can take the timed test as many times as they'd like and they can keep their best time. Almost every student makes gains from their previous test. They are relaxed and alert.

Special treatment. Have you ever made a request of someone in an official position and heard a response like this, "I'd really like to help you with this, but if I did, I'd have to do the same thing for everyone who might ask. And, since I can't do that, it wouldn't be fair to do it for you."? How did that make you feel? What if the person replied like this: "I can see that you're one of our most loyal customers. I'm, technically, not supposed to do this, but I'll take care of it just as you asked. Thanks for your business." How would that make you feel?

In essence, special treatment is a signal that one is a member of a group, and that membership in the group occasionally affords one benefits not available to non-members. You've experienced the sensation of special treatment if you've ever received a warning ticket from a police officer, or if you've ever been late to work and the boss just winked and said, "Don't make a habit of it." Loyalty programs operate on the principle of special treatment. Frequent flyers enjoy benefits not available to all fliers. Grocery stores offer special savings to those who possess a loyalty card. In so doing, these companies cement a bond of membership with consumers. There is a sense of reciprocity in these relationships that benefits both the consumer and the provider.

Mr. Sigmund, a ninth grade Language Arts teacher, called Josh to his desk one afternoon. "Josh, I was able to score two free passes to the movies for this weekend. I overheard you saying you would like to go. Why don't you take these and enjoy a show?" "Wow thanks! What did I do to deserve this?" asked Josh. "Nothing really," replied Mr. Sigmund, "It's just a perk of being in the best ninth grade Language Arts class in the school!"

In the classroom, when teachers signal to students that they are members of a special group (our class), they create a more enriched environment characterized by a mutual sense of connection and reciprocity.

Positive rituals. Just like special treatment, the effect of positive rituals is to signal group membership. Military units have special ceremonies to commemorate a completed mission, or a new deployment. Churches employ rituals such as baptism, communion, or call and response readings to promote unity in the faith. Sports teams have special elbow bumps, or high fives to signal group membership. Positive rituals are repeated reminders that one is a member of a special group. Knowledge of the ritual and exactly how it is to be performed is limited to the members of the group.

Mr. Johnson, a fourth grade teacher, responds to an especially thoughtful student response by inviting students to give the responder a "fantastic." The students all point their fingers like they are holding a bottle of Fantastic, the cleaning spray, and say, "Squirt, squirt." They then make a circular motion with their other hand as if wiping with a paper towel and say, in unison, "Squeak squeak." This is a positive ritual, a repeated gesture that is unique to the group. It identifies those who know it as group members and excludes those who do not know the technique. Mr. Johnson has many more positive rituals that he has taught his students and they alternate using them throughout the day. It's as if Mr. Johnson has created a secret society in his classroom, where students are bound by blood oaths of loyalty and commitment.

Little do they know that fourth graders right across the hallway and also across the nation are all saying "squirt, squirt, squeak, squeak" in response to extra good answers.

More collaboration, less competition. Enriched social environments are characterized by collaboration. Classroom environments are more positive when students are working with one another to achieve learning goals rather than competing against one another for scarce rewards or recognition (Kohn, 1999). This is not to say that a little classroom competition is always harmful. Many an afternoon are made more productive by a "boys vs. girls" quiz game or a team sharks vs. team dolphins math competition. Competition creates energy and energy is necessary for engagement and learning. Still, on balance, classroom environments are more enriched by a spirit of family, togetherness, team spirit, and unity.

A true, and sad, story: I was observing a ninth grade English classroom one morning and noticed that the students were sitting according to an unusual seating chart. Students were seated according to their test averages. There were thirty seats in the classroom arranged in six rows of five. The #1 position, reserved for the student with the highest average was in row 1, seat 1. The student with the lowest average sat in row 6, seat 2 (there were 27 students, total). I asked the teacher how this impacted the classroom environment. She said she believed it motivated the students and that they appreciated knowing exactly where they stood. I was stunned. As I reflect on that experience, I believe the teacher was correct, in a sense. Fear of failure and constant comparison to others can be motivating, just as hunger can motivate a person to find work. A classroom with a truly enriched social environment, however, seeks to motivate students through the inherent value in learning, the fun of working together, and the positive energy that flows from being a part of a high performing team.

A final note on collaboration and competition: In the rat research, the enriched environment cages were set up to avoid competition for basic needs. All the rats had all the food, water, space, nesting material, and access to toys they needed. It was the complex social relationships that developed among rats, in the absence of competition over basic needs, that appeared to increase dendrite density and brain development (Diamond, 1984). Perhaps we could learn a lesson from the rats.

Theme 17: Success

Definition. The ability of the teacher to increase and sustain student effort by designing and adapting learning tasks to ensure that students experience success.

Elaboration. Success and effort are linked. When students give great effort to a learning task, they are more likely to be successful. And, when students experience success at a learning task they are more likely to give effort (Cummings, 1992). Effort and success, then, are mutually reinforcing. They comprise a positive feedback loop. Effort leads to success, which in turn, leads to even more effort, which leads to even more success. Of course, the loop can move in the opposite direction too. Low effort leads to failure, which in turn, leads to even less effort, which in turn, leads to even more failure.

Madeline Hunter describes student success as a key to student motivation. She explained that teachers play an essential role in designing and creating student success. Hunter (1982) wrote,

> You may wonder how you can affect students' successful achievement. Isn't that a result of the students' ability and effort? In part, yes. But student success is also responsive to two other factors which you control. The first is the level of difficulty of the learning task, something you can adjust since you set the task. The second factor is your teaching skill which will make students' learning more probable (p. 14).

The Hungarian psychologist, Mihaly Csikszentmihalyi, suggests that a state of flow, or optimum experience, is possible when a balance is struck between the challenge of the task and the skill of the performer. This flow state, similar to being in the zone or in the groove, is intrinsically motivational and is characterized by a sense of immersion or absorption in the task at hand (Csikszentmihalyi, 1990).

Student effort is affected by the student's expectation for success and also by the degree to which students see value in that which they are learning (Feather, 1982). To receive full effort, a learning task must be seen as doable and also meaningful. Students will withhold effort from learning tasks they see as trivial, unimportant, irrelevant, or uninteresting (Feather, 1992). Effort is affected by the value of the task itself (inherent value) and by the value of the consequences of performing, or not performing, the task (consequential value) (Feather, 1982).

The relationship among effort, success and value can be expressed as a mathematical equation: Effort = Expectation of Success x Value (Cummings, 1992).

Effort. A student's effort can be described as the product of two factors-aptitude and persistence.

Aptitude is the student's learning rate (Carroll, 1963). A student with a high aptitude for music, for example, can learn musical concepts and skills faster than a student with a lower aptitude for music. Aptitude is determined by, among other variables, how much background knowledge and experience a student already has in an area of study (Gardner, 1983). *Success tip*: Engage students through areas of higher aptitude. A student with a high verbal aptitude might be more successful if allowed to record a persuasive paragraph before writing it down. A student with high kinesthetic aptitude would do well to "act out" the solving of a binomial equation rather than just considering the problem mentally (Gardner & Hatch, 1989).

Persistence is the student's level of "stick-to-it-iveness." Students who are able to persist in a task for an extended period will, on balance, learn more. Aptitude and persistence are interdependent since the lower a student's aptitude, the longer he will require (persistence) for mastery. *Success tip*: Provide students more time for mastery. Lower aptitude students, especially, simply need more time to achieve success. This can be accomplished by providing more time, providing additional practice sessions, shifting time from other activities, adding before and after school opportunities, or applying advanced teaching/learning strategies that accomplish more in less time.

Expectation for Success. A student's expectation of success is determined by two factors: perception and prior experience.

Perception is the degree to which the learning task looks doable. Teachers can alter a student's perception of a task by positioning the task to appear easier, more approachable, or similar to a familiar task. *Success tip*: Manage student perceptions. A difficult math problem from page 367 in the textbook, can look less intimidating if it's presented by itself, written with a marker on a piece of construction paper. Working in a group of four, rather than by oneself, can make tough assignments seem less so. Breaking a long project into separate parts and focusing students' attention on just the next part can make the work seem less daunting.

Prior Experience. Success breeds success. Students gain momentum and a sense of self-efficacy when they accomplish tasks successfully (Brophy, 1987). Often, the best predictor of student effort is to check the recent past to look for instances of success. *Success tip*: When a teacher ensures that students are consistently successful, the momentum from prior successes carries over to current work.

Value. The value that a student sees in a learning task is the sum of its inherent value and its consequential value.

Inherent Value. Inherent value refers to the enjoyment and importance found in the work itself, not in external rewards or sanctions (Kohn, 1993). *Success tip*: Rely mostly on inherent value of learning tasks. Point out to students how much they enjoy reading, how they always like to solve hard problems, or how they are so good at coming up with novel ideas. Motivation is stronger and longer lasting when it is embedded in the work itself (Csikszentmihalyi, 1990).

Consequential Value. Consequential value refers to the value that a student places on a positive consequence of giving effort to a task, or the avoidance of a negative consequence due to the withholding of effort from a task. *Success tip*: Use consequential value temporarily, perhaps only initially, until inherent value can be realized. Withdraw consequences as soon as possible so as not to limit student effort to the minimum levels required to gain rewards or avoid sanctions.

Theme 18: Performance Feedback

Definition. The ability of the teacher to increase students' mastery of and persistence at a task by providing abundant, immediate, and specific knowledge of results.

Elaboration. Timely and specific performance feedback is an important ingredient in the recipe for student learning. Feedback allows learners to quickly self-adjust their performance, which is conducive to mastery (Sousa, 1995, p. 45). Beyond this direct benefit to mastery, performance feedback also delivers another, complementary effect- persistence.

When the brain is engaged in a recurring loop of practice-feedback-adjustment, it seems to not mind exercising the loop again and again. This "stick-to-it-iveness" effect sometimes manifests itself in a temporary loss of time awareness (Csikszentmihalyi, 1990). One can lose track of time during a good conversation with a friend, an interesting internet search, or a favorite video game. All three of these activities activate the brain's "do something-receive something back-do something again" response- persistence.

Although not completely understood, the basic mechanism behind this increase in persistence is likely to be chemical in nature. The Canadian neuropsychologist Donald Hebb proposed in 1949 what is now known as Hebb's axiom: "Neurons that fire together wire together" (Hebb, 1949). During repeated performance feedback loops, electrical and chemical energy courses through neural networks reinforcing networks that receive positive feedback and re-wiring networks that do not yet produce the desired result. This process of repeated reinforcing and revising of networks causes chemicals to be synthesized and released causing a positive, pleasant sense of well-being.

In a sense, the brain is being chemically rewarded for doing its work. This chemical release-reward loop is one way of understanding how performance feedback can cause persistence in the task at hand. "Current research suggests that the brain is capable of making its own rewards. By producing and releasing natural opiates and endorphins, the brain can create a natural high." (Kaufeldt, 1999, p. 187).

Success principles for performance feedback.

As teachers plan to provide performance feedback to their students, it is helpful to consider these three attributes of effective performance feedback.

Abundant feedback, rather than scarce feedback. Learning is optimized when feedback is torrential (Jenson, 1998, p. 43). Most people with reasonable athletic ability can learn to snow ski in a single day. Why? Because every muscle and nerve in their feet, legs, and torso is receiving feedback multiple times each second on how to stay upright and move down the mountain. Soon they can ski well enough to enjoy the rest of the day. The feedback is abundant.

Immediate feedback, rather than delayed feedback. The positive effects of learning feedback are multiplied when the feedback loop is fast (Hattie & Timperley, 2007). When hours or days pass between the trial, the feedback, and the next trial, feedback is still valuable, but the reinforce/revise loop is interrupted and therefore the momentum for learning is lost. A good rule of thumb is that feedback should return to the learner within the time they can hold their breath.

Specific feedback, rather than vague or generalized feedback. In order to gain the benefits of performance feedback, it is important that the feedback be "actionable." Actionable feedback provides not only a general judgment of the work, but describes a specific element of the work that can be immediately reinforced or revised. Let's say students are writing persuasive paragraphs and the teacher is moving from student to student providing feedback. "Nice work!", "B-", or ☺ provides only a general judgment of the work. More specific, actionable, feedback sounds like "Your first sentence is attention grabbing. That's nice work" or "I'd like for you to have a least three elaborations on your opening statement. You have one, and it's a good one. Add two more that are just as interesting."

Successive Approximation. There is a special category of performance feedback that maximizes the reinforcement/revision process. Successive approximation is learning through quick, repeated practice with small adjustments toward a goal. The psychologist B.F. Skinner first used the term successive approximation in detailing his theory of operant conditioning (Skinner, 1937). A Spanish teacher employs successive approximation when he asks a student to practice the rolling r sound as in the word roho (Spanish for red). The teacher and student go back and forth, each saying the word, perhaps a dozen times, until the student can say it just right. When students are engaged in this type of feedback they are perhaps never more motivated and engaged as they get closer and closer to the goal with their teacher right there guiding them.

Some insights on performance feedback can be gained by considering how it works outside a typical classroom.

Puppy training. In puppy training, it is crucial to deliver the treat immediately after the puppy, performs the desired behavior. The feedback must be immediate. No effective puppy trainer would give a dog a treat and say "By the way, that was such a good fetch you did yesterday."

Golf lessons. In golf instruction, teachers often use video replays to help the student see the specific intricacies of the golf swing. Rather than saying, "That's a nice swing. Keep it up," the instructor might pause the video to point out exactly how the student's left elbow is positioned. Then the instructor might say, "When you keep your left elbow tucked in close to your body, your swing stays on plane just fine." The specificity of the feedback enhances learning.

Language learning. One of the best and fastest ways to learn a new language is to be totally immersed in the location, language, and culture where the language is spoken. An immersion experience provides such abundant feedback that the learning is rapid, relevant, and memorable.

Video game design. Game designers know the effects of abundant, immediate, and specific feedback to the player and they design it into every level of every game. It is a compliment to the game designer for a player to say "I couldn't put it down."

Theme 19: Stagecraft

Definition. The ability of the teacher to enhance, deepen, or prolong student engagement by utilizing a theatrical treatment such as props, music, lighting, scenery, choreography, body position, voice, music, costumes, and visual/audio effects.

Elaboration. Sometimes the difference between an effective lesson and an unforgettable lesson is the way the teacher captures and keeps the learners' attention and interest using techniques borrowed from theater. Teachers can make lessons significantly more impactful and memorable by applying theatrical elements.

There is much to learn in observing how actors ply their craft, how choreographers create a symphony of experience, how expert set designers create engaging scenery, how great lighting focuses attention, and how a good musical score highlights an unforgettable performance (Rutherford, 2009a, p. 1). When theatrical techniques are employed skillfully and in the right combinations, the audience is transported through a momentary suspension of disbelief (Coleridge, 1817), to a far-away place or into the mind of an interesting character. This ability to enhance and transform another's attention has great utility in the theater (Grainer, 2010) and also in the classroom.

As teachers borrow theatrical techniques for the purpose of enhancing students' attention, it is helpful to think in terms of applying a theatrical *treatment*. A treatment is a specific classroom application of a specific theatrical technique. A treatment does not add to or alter the curriculum standard or the purpose of the teacher's lesson, but rather highlights aspects or segments of the lesson by causing the learner's mind to linger a bit longer, ask a few more questions, or process in a slightly deeper or different way. The treatment might be the way an object or area is lit, it might be a prop that grabs attention, or it might be the way the teacher moves throughout the classroom space.

To be sure, classroom teachers are not expected to be perpetual actors on the classroom stage, and every lesson need not be "performed" to be effective. It is the technical aspects of theater such as lighting, props, or staging that have the most import to the classroom, not the acting skills of the teacher.

Stagecraft, then, is mostly about the applications of technical theater to the classroom. Not every moment of instruction needs a theatrical treatment and a teacher should not feel compelled to add a treatment at every turn. Sometimes, though, it is the treatment that opens the door for the learner's mind to create and cement a more elaborate understanding of the information presented. Teachers can employ, when needed, specific treatments to lengthen student's attention spans, deepen their observation skills, or create a particularly hard to forget classroom moment.

Some elements from technical theater include.

Props. Short for "property of the theater company," props are artifacts from the scene and setting of a performance that add credibility to the story (Richardson, 1996). A pirate is more believable with a cutlass in his teeth, Moses looks more like himself with a scroll in hand, and the quiver of arrows is a key signal that the man in green tights is indeed Robin Hood. Likewise, the Geography teacher who holds a globe while teaching latitude and longitude makes a more memorable point. The teacher can go a step further by distributing small, inflatable globes to all the students so they can trace for themselves the prime meridian, equator, and Arctic Circle.

Lighting. The lighting director knows that the audience's eyes, and therefore their mind and mood, will follow and fix onto what is lighted. "Light the talent" is one of the basic principles of lighting design (Pilbrow, 1991). Teachers can apply this principle by paying attention to classroom lighting- keeping key areas and key people in the light. For added effect, inexpensive LED spot lights (best with a flexible gooseneck and clamp) can draw attention to a flip chart or a display area.

Scenery. The human brain has a great capacity to complete an incomplete picture (Maier, 1994). This means that to be convincing, a scene need not be elaborately and completely decorated in order to create the desired illusion of place (Arnold, 1985). In the classroom, a couple of palm fronds are all that is needed to begin the illusion of a tropical ecosystem. Student's brains, with just a bit of the picture provided by scenery, can fill in the gaps and create a mental scene that enhances attention and engagement.

Costumes. As with scenery, just a bit of a costume goes a long way toward creating a more memorable experience. A Social Studies teacher could don a coonskin cap to increase attention as he provides insights into western expansion during the 1800's. And, there's nothing like a pair of lightning bolt earrings to complete the look for that first day of the electricity unit.

Music. In theater, the musical score serves to set the tone for the scene and to complement and punctuate the dramatic action onstage. The P.E. teacher who plays salsa music to keep the aerobic exercise going, and the writing instructor who plays soundtracks of softly chirping crickets behind the "summer nights" writing assignment both understand the value of an intentional musical treatment.

Special Effects. Special effects serve to add interest, surprise, and focus to the learning tasks at hand. A Chemistry teacher freezes rubber balls in liquid Nitrogen and then shatters them for effect. A literature teacher plays high pitched whale sounds as she introduces *Moby Dick* (Melville, 1851). A middle school teacher turns out the classroom lights and uses a flashlight to up-light her face as she reads from Edgar Allen Poe's *The Raven*. "Once upon a midnight dreary, while I pondered weak and weary..." (Poe, 1845).

Theme 20: Complementary Elements

Definition. The ability of the teacher to sequence instructional experiences that build on the preceding and set the stage for the subsequent.

Elaboration. A well-designed sequence of classroom experiences (usually a pair, occasionally three) can produce a more elaborate learning experience in total, than each of the parts can contribute individually. It seems, with just the right set-up or follow-up, 1 + 1 can = 3. Apple pie is good and vanilla ice cream is too. But together they are "apple pie a-la-mode." Good + good = great!

Two things can be said to be complementary when they, in a way of thinking, complete each other. The Free Dictionary.com defines complementary as *"combining two or more things in such a way as to enhance or emphasize each thing's qualities."* Merriam Webster's Collegiate Dictionary (10^{th} Edition) offers *"Serving to fill out or complete" and "mutually supplying each other's lack."*

Complementary colors can make a room's paint scheme "come together." A well chosen tie or scarf can complete an outfit in a stylish way. In both cases, the elements were entirely satisfactory when considered individually, but when taken together, were enhanced. The total effect becomes greater than the sum of the parts.

In the culinary arts, a chef creates a series of courses that fit perfectly in sequence...a tart salad followed by a savory second course, followed by a sweet dessert. Each course is delicious individually, but when enjoyed in sequence, the effect is much enhanced. Some food parings are so classically complementary that we are used to seeing them together, like a hotdog with chili, peanut butter and jelly, cookies and milk, French fries and ketchup, or wine and cheese (Page & Dornenberg, 2008).

In music composition, a composer creates an opening movement that slowly builds momentum, then follows with virtuoso performances on individual instruments, then allows for a time of disharmony, which is, at the perfect time, then reconciled into a triumphant chorus. Each movement is made more impactful by positioning it next to another movement that is different, yet complementary (Arnold, 1985; Belkin, 2008).

In the classroom, just like in the kitchen or concert hall, learning can be greatly enhanced by positioning individual instructional episodes next to complementary ones. A 3rd grade teacher begins the day with an individual reflective time of journaling, then transitions into a whole group movement oriented activity, then to a small group, cooperative learning session, then back to an individual time of elaboration and question generation, then to a whole group Q/A game, then a short break, then some more... just like a fine meal proceeds from course to course, the preceding sets the stage for the subsequent. The total effect is greater than the sum of the parts.

While there is not a precise formula for designing classroom elements that are complementary, there are classical patterns or "types" of complementary elements that teachers can use to design complementary elements.

Completeness. In the movie Jerry Maguire (TriStar Pictures, 1996), Tom Cruise speaks the memorable romantic line "*I love you... you complete me.*" to Renee Zellweger. When two elements complete each other, one element contains aspects that are lacking in the other. The two elements, taken together, form a whole. Presumably, Tom Cruise's character, Jerry, recognized that Renee Zellweger's character, Dorothy, possessed character or personality traits that he did not. Evidently, she agreed. Her response, perhaps even more memorable, was "*Shut up,* *just shut up. You had me at hello.*"

Likewise a teacher might position a free writing time, where students write quickly and unhindered by convention, next to a proofing activity, where students identify and correct grammar and usage errors in their and other's free writing work. One learning experience completes the other.

Yin-Yang. According to ancient Chinese philosophy, the concept of yin and yang represents a balance between the universe's opposing, yet complementary forces. Yin-yang complements are dependent on one another for their very existence. Yin Yang literally means dark and light. The concept of darkness is meaningless without an understanding of light. Masculine is undefined without an understanding of feminine. To recognize good, one must acknowledge the absence of good, or evil (Latener & Leon, 2005, p. 869).

In the classroom, yin-yang complementary elements not only exist side by side in the instructional schedule for the day, but depend on each other to create comprehension. In acoustics, the teacher might position the concept of dissonant sound waves right next to the concept of resonant or harmonic waves. Comprehension of the one both precedes and requires comprehension of the other. Twist of plot, requires an understanding of predictable plot. Irony requires a prerequisite understanding of logic. The mathematical concept of zero is meaningless without the presence of a non-zero value. Adjectives don't exist without nouns, nor adverbs without verbs.

Contrast. This is perhaps the simplest and easiest to apply pattern of complementary elements. Contrast means that the complements are different from each other in some significant way. A fast paced, active session in the classroom can be followed by a lower energy, more reflective time. Collaborative work should be positioned adjacent to independent work. Difficult concepts are best positioned nearby easier concepts. Whole group instruction is best followed by activity centers or small group work. With the principle of contrast, it is not the case that there is just one best complement to any particular instructional element, but that the best complement to any instructional element is not more of the same element. Mashed potatoes are a great side dish to any number of entrees. But they don't go well with scalloped potatoes or baked potatoes. The best complement to a potato is a non-potato (Acheson, 2011).

Role Swap. The best follow-up to a session of question answering can be a session of question posing. Solving math problems is an excellent warm-up to designing and writing math problems. The learning produced by practicing a skill is deepened by a time of coaching and feedback to another's practice. The best way to learn something is to prepare to teach it to others. Speaking is developed through listening, and performances are enhanced by judging other performances.

Preliminary Practice. To provide students with preliminary practice means to isolate the harder parts of a skill and practice them separately before integrating the skills into a larger context. Especially for skills that require multiple steps or that employ a number of skills at once, it is effective to precede the skill work with a period of intense practice on the essential or most difficult skill (Hunter, 1982). For a set of word problems that require the addition of fractions with unlike denominators, the teacher might begin with a mini-lesson on finding the least common denominator. An orchestra teacher might ask students to practice a difficult measure of a performance prior to practicing the whole performance. An elementary math teacher does well to ask students to warm up by practicing writing vertical digits in a perfect column, before he introduces three digit subtraction. In all these cases, the complementary elements include a skill being taught right after the rehearsal of the skill's most difficult or essential component- a nice one-two punch.

Theme 21: Time and Timing

Definition. The ability of the teacher to appropriate the optimal amount of time to each instructional element, choose the most effective interval between elements of instruction, and utilize instructional elements at just the right place in the lesson to optimize their efficacy.

Elaboration. Timing is everything. The difference between an adequate experience and an excellent one is often found in the timing of the elements that comprise the experience, not so much in the elements themselves. This is particularly true of anything that is transactional in nature, where the essential action is found in the interplay of two people or combinations of individuals and groups.

Good timing is critical in stand-up comedy, public speaking, and storytelling. A successful auto salesman knows when to transition from shopping to buying (Oldroyd, McElheran, & Elkington, 2011). Musical composition is just as much about the spaces between the notes as the notes themselves (Goodridge, 1999).

Effective parenting of teenagers requires one to choose the right time for sensitive discussions. Sports superstars do well to time their retirements with care, leaving the sport just before they tarnish their legacy. In all these cases, something transactional is occurring between or among people. And, in all instances of human transaction, it is the timing of things, not only the things themselves, that leads to a successful outcome.

Teaching, of course, is highly transactional. Each school day is filled to the brim with human interaction. Teachers interact with students. Students interact with one another. Teachers and students interact with educational materials and technologies. In all these transactions, the difference between adequate outcomes and excellent outcomes is often the teacher's command of time and timing.

To better understand and apply the techniques of time and timing in the classroom, it is helpful to break the concept down into three component parts: *duration*, how long to do something; *interval*, how long to wait before doing the next thing; and, *readiness*, when to do something.

Duration. A comedian develops her "act" to last just under eight minutes. She designs three short pieces into the act at 45 seconds each, two longer pieces at ninety seconds each, and one ending piece that covers 2:45. She begins with a 45 second piece, then uses the two 90 second stories, then to another 45 second joke. She finishes with her best material after the audience is suitably warmed up-a brilliant 2:45 story with a wicked twist at the end. The audience screams for more but the comedian always leaves them wishing she would tell just one more joke… she never does (Rutherford, 2009a, p. 2).

What is the optimal duration for an instructional device-a question, an experience, a written assignment, a discussion group, a hands-on activity, a cooperative learning structure, etc.? The optimal time is usually to end the device just ahead of the learner's dip in energy and interest, just like the comedian. All instructional devices have an energy curve over time. Typically, classroom activities start slow, build in energy and intensity, reach a maximum, and then begin to decline. An excellent time to end an activity is just before the maximum, not after. Why is this? There is a relationship among time, energy, and efficacy in every classroom (Matchock, 2010). When one episode of teaching ends just before the peak, the students can transfer the upward trend in energy to the next learning opportunity. This provides for a high energy closure for the preceding activity and a high energy beginning for the next one.

Interval. A well timed interval allows enough time for the audience (learners) to engage with the device- to complete a thought, to imagine an answer, to conjure a word-picture. The purpose of the intervall is to clear the brain's working memory for the next set of items through a moment of transition (Rowe, 1974).

A rousing political speech has a flow to it. The key sound bites are surrounded by filler, transition, and water-treading. Too many nuggets delivered too often would overwhelm the listeners, too few would bore them. There is an optimal balance between nugget and filler and an optimal interval between each nugget. In stand-up comedy this perfect interval is called a comedic beat, just the right length of pause to set up the punch line.

In the well-timed classroom, transitions, wait time, segues, and pauses are designed to provide just enough time to extend thinking, but not enough to invite distraction (Smith, 1988). As a general guide, transitions between activities should be shorter when the activities are similar and longer when the activities are different (Atwood & Wilen, 1991). A longer transition is particularly helpful when the activities look similar but are not. Negative transfer and misconception abound when there is inadequate time between confusing concepts (Hunter, 1982). In a fine restaurant, the waiter will offer a palate cleanser, perhaps a bite of sorbet, between courses - a nice transition that prevents negative taste transfer.

Readiness. A successful salesperson doesn't go for the close when she is ready, but times the close to match the client's readiness. Likewise, a successful teacher looks for cues that the learners are ready for the next learning experience instead of simply following the pacing guide or lesson plan. Ten minutes of instruction delivered at a moment of peak readiness may be worth 100 minutes of instruction delivered at another time. Students can be ready *cognitively*, meaning that they are intellectually ready for the coming task. They can be ready *emotionally*, meaning that their affective state is a good fit for the type of learning to be experienced. They can be ready *experientially*, meaning that they have relevant and recent real-life experiences that can support and structure the new learning (Bredekamp & Shepard, 1990). Teachers should also consider students' *energy* readiness (Weith & Zacks, 2011). At 2:15 pm, after a morning field trip, a late lunch, and a big test, the students (and teacher) may be ready in every way other way, but there is just not enough energy available for success. "Let's start this tomorrow morning when we're fresh," the teacher says. It's all about timing.

Theme 22: Personal Presence

Definition. The ability of the teacher to establish and maintain an interpersonal connection with students that is characterized by influence, affinity, interest, respect, admiration, loyalty, importance, efficacy, and positive regard.

Elaboration. Sometimes the reason a lesson is well-learned isn't the content of the lesson, the teacher's skill in planning and design, or the techniques used to present information or engage students. Sometimes, the reason for success is not primarily related to the lesson, but to the person who is teaching it. Call it respect, admiration, persona, credibility, influence, charisma, gravitas, or charm. By any name, it is the boost to learning that is bound up in the person of the teacher.

Much has been studied and written about the organizational effects of personal traits and characteristics. The leadership literature alone is substantial, not to mention contributions from the fields of psychology, personal development, and popular culture. Daniel Goleman in *Emotional Intelligence* points out that human emotions are contagious and humans appear to be designed to influence one another in powerful ways (Goleman, 1995). Stephen Covey in *Principal Centered Leadership* cites "thirty methods of influence." (1992, 119-128).

An Army Captain asks for three volunteers from his platoon to accompany him in a dangerous rescue operation inside a small town in central Afghanistan. The captain, although barely older than the rest of the platoon members, commands much respect from his troops. During the previous three months he has proven himself to be not only a brave and disciplined soldier, but also a warm and approachable human. He is quick to admit his mistakes, first to offer encouragement, and slow to blame others. He leads through a quiet but strong, persuasive style. All twelve of the soldiers volunteer (Rutherford, 2009a, p. 3).

What are the attributes of leadership that combine to make this Army Captain so influential with his men? It seems to me that personal presence is easy to spot but difficult to define. Personal presence, unlike many of the other *Artisan Teacher* themes, is not so much a technique to be learned, but more a set of personal attributes that serve to draw others in and create relationships that support and enhance the work to be done. Still, based on many classroom observations, there are some patterns that emerge that can help teachers identify and develop traits that are important to their own personal presence.

Teacher traits and behaviors associated with personal presence.

Being present in the moment. Teachers have to do many things at once. They multi-task, deal with distractions, and try to balance work, home, and personal lives. Still, teachers are powerful when they are 100% present and available to the opportunity at hand - not thinking too far ahead, not dwelling in the past, not being preoccupied, not being self-focused. We all know what it's like to be in the presence of someone who is distracted. And, we've experienced how powerful a moment can be when the person we're sharing it with is "all-in" with us (Bowling & Hoffman, 2000). With all distractions and pressures of the classroom swirling around in a teacher's mind... those that can, if just for a moment, block it all out and simply be present and available to students are exercising a powerful component of personal presence.

A little personal complexity. I've noticed that teachers who can't be described with a single word are more compelling to students than those who can be. "He's strict, but spontaneous." This is not to suggest that teachers should be complicated and unpredictable. It is just an observation based on many, many classroom visits. A little complexity draws students' attention and engagement. It makes the teacher more unique, more interesting, and more memorable (Leiter & Maslach, 2006).

Princess Diana is greatly loved and admired throughout the world. Perhaps her most endearing characteristic was her ability to be, at once, royal and common. She was Diana, Princess of Wales, a member of the British Royal Family, and also a former kindergarten teacher... both. This duality is often a part of strong personal presence. We are drawn to individuals who are intelligent - yet approachable, beautiful - yet humble, large - yet gentle, silly - yet profound, or accomplished - yet other-focused.

Being influence-able. Students are more influenced by teachers who are influenced by their students. Influence, like trust and communication, is a two-way street (Fukushima, 1999). A teacher might say to students "I've changed my thinking after reading your paper. You've convinced me that..." or "I was a little down this morning and not in the best of moods. But, after working with you guys for just a few minutes on this and seeing your good ideas, I feel a lot better. Thank you for that!" These words signal that what students do personally affects the thoughts and feelings of the teacher. Interesting isn't it... being *influence-able* makes the teacher more *influential.*

Loss of self-consciousness. There is something extra compelling about a teacher that occasionally becomes so engaged in the lesson that they temporarily forget to worry about what others think of them. I suspect this is because students are themselves self-conscious beings and to see another person (the teacher) temporarily freed from the normal state of "worrying what others think" is compelling indeed.

I vividly remember watching my 11th grade chemistry teacher, Everett Smith, lead us through an experiment. He became giddy with excitement and anticipation waiting for the reaction to occur! We all made fun of Mr. Smith for being "so into it," but privately, I envied him. I remember thinking to myself "One day I hope I have a job that I enjoy as much as Mr. Smith enjoys teaching chemistry." By the way, five years later, I became a chemistry teacher myself - in no small part because of Mr. Smith's personal presence.

Mihaly Csikszentmihalyi (1990), in his national bestseller *FLOW- The Psychology of Optimal Experience*, identifies loss of self-consciousness as a key indicator of the Flow state (pp. 62-63). Flow, according to Csikszentmihalyi, is the state of being completely caught up in an activity such that it is enjoyable and satisfying. A violinist, in the middle of a concert, or a rock climber, completing a technically difficult part of an ascent might be said to be in a state of flow. Csikszentmihalyi concludes loss of self-consciousness is often accompanied by a sense that time does not pass in the way in usually does. "It can't be 2:30 yet, that's not possible. It seems we just got stated."

Theme 23: Delight

Definition. The ability of the teacher to create instances of learning that are particularly pleasing, charming, unexpected, or surprising… to create a moment that is unforgettable, has a twist, or exceeds expectations.

Elaboration. A delight is a positive surprise. When something happens that benefits us and we were not expecting it to happen, we experience the sensation of delight. We usually respond to a delight with an exclamation of "oh my" or "wow", or at least a broad smile. Recently I pulled on a pair of old jeans that I had not worn in quite a while. I was delighted to find a crumpled five dollar bill in the pocket… "sweet!" I said to myself. The essence of delight is surprise.

Surprise enhances memory (Fletcher, Anderson, Shanks, Honey, Carpenter, Donovan, Papadakis & Bullmore, 2001). The human brain is oriented toward survival. We like crossword puzzles, music, and stimulating conversations, but the primary function of our brain, from an evolutionary perspective, is the survival of our physical bodies in the current environment (Schoen, 2013). One of the ways the brain works for our survival is to predict the near future. When the brain successfully predicts what will happen next, we are prepared for it and this increases our chances of surviving it. So, in an operational sense, the brain does not like surprises. A surprise is a failure to predict the immediate future. As such, the brain pays especially close attention to surprises, so as to not be fooled again. If a disembodied brain could talk, it might say, after encountering a surprise, "Fool me once, shame on you. Fool me twice, shame on me."

For the record, negative surprises enhance recall too (D'Argembeau, Comblain & Ven der Linden, 2002). I remember gathering some firewood from a stack one day and uncovering a snake coiled up between the logs. Fortunately it was cold outside and the snake didn't move. Still, from that moment on, every time I approach a stack of firewood, my brain instantly recalls the image of the coiled snake. Since they are linked to our survival, surprises are extra-memorable. We are designed to remember well things that surprise us.

When we survive an occurrence that was not predicted, we experience a moment of relief that the occurrence didn't do us in. "Whew, that was a close one." When the occurrence turns out to be pleasant, and not just a near miss of something unpleasant, we experience an acute double sensation. We find ourselves not only surviving an unpredicted occurrence, but benefiting from it as well. This sense of "Whew" plus "Oh my" is one way of understanding the sensation of delight.

Delights, being surprises, create strong memories. These "delight memories" can serve as navigation aids (signposts, waypoints, memory markers) in a student's memory. This allows faster and truer navigation back to the memory when recall is initiated (Fletcher, et al. 2001).

Types of delight.

Random act of positivity delight. We tend to remember extraordinarily positive events (D'Archembeau, et al. 2002). I was in the drive-through lane at a fast food restaurant a few days before Christmas one year. When I reached the window, the young server said "The car ahead of you paid for your food. He said to tell you Merry Christmas." I'll never forget that.

A fourth grade teacher was working individually with a struggling student on converting fractions to decimals. After the student got a few problems in a row just right, the teacher said "Wow, Carl, you've got it now, good work." Carl said, "Yeah, I think your calculator is lucky for me. I was getting them all wrong on mine." The teacher took a sharpie pen and wrote Carl's name on the back of her calculator and gave it to him. "Don't tell anyone I gave you this," she said. "Whenever you use it, remember how you learned to convert fractions to decimals on it." "Wow, thanks." said Carl as he grinned from ear to ear.

Suspense-resolution delight. We tend to remember how things begin and end (Sousa, 1995). The seventh-grade math teacher placed a huge glass jar of jelly beans on the front table. Students, as part of their probability and estimation unit, were asked to examine the jar all week and be ready to estimate the number of jelly beans on Friday. Throughout the week, the teacher introduced various ways to estimate the total - by volume, by weight, by appearance, and so on. On Friday the teacher asked the students to play a drum roll on their desks before revealing the true number of jelly beans… 1,458! Three months later, while reviewing for end of year exams, the teacher asked "How many of you remember the jar of jelly beans and the ways we estimated their number?" Every hand was raised.

Preparation delight. The 11th graders were expecting a typical day of teaching and learning in Mrs. Sullivan's Business Education class Wednesday afternoon. They were surprised and amazed at the scene as they entered the room. The tables were set with linen and fine china, flowers were at each table, classical music played in the background, and each student's name was carefully engraved on place cards. "Ooohs and Ahhhs" filled the classroom as students entered to begin their unit on business etiquette. Ten years later, at an important business diner with key clients, Marion still remembers that day as she confidently selects the shrimp fork for the next course.

Twist of plot delight. We remember times that we were fooled (Schoen, 2013). A writer weaves an interesting and entertaining plot, then delivers a delightful twist at the end taking the story in a completely unexpected direction. The reader immediately re-reads the chapter and smiles.

The fifth graders were seated on the carpet, ready to listen in as their teacher read a few key passages from *Tears of a Tiger*, by Sharon M. Draper, one of their favorite authors. In addition to enjoying the story, the students were working on understanding how the author's purpose influences a piece of writing. The teacher reads a few paragraphs and stops. "Wouldn't it be great if we could really ask the author what her purpose was in writing this book?" "What do you think she would say?" At that moment, Sharon Draper walks out from behind a curtain and says to the class, "Well, let's talk about that." Unbeknown to the class, Sharon Draper and the teacher were sorority sisters in college. Sharon often drops in to surprise students and answer their questions. They will never forget that day's discussion of author's purpose.

Exceeds expectations delight. We remember when things turn out better than we thought they would (D'Archembeau, et al. 2002). A business traveler enters the department store at 8:55 pm looking for a clean shirt to wear the next day. "How late do you stay open?" he asks the salesperson. "As long as you need us," the salesperson replies. As the traveler hurries to make his purchase he thinks how unexpected that response was and how he'll remember to shop here more often (Rutherford, 2009, p. 4).

Jasmine, a 2nd grader, had been absent for two days. The note from the office said that she had the flu. On the evening of the second day, Jasmine's teacher called her home to check on her, ask if there was anything she needed from school, and just to express to Jasmine's mother how she and the class missed Jasmine and hoped she would return soon. The young mother was delighted at the call. "It was more than I expected" she said to at least a dozen other parents over the next two weeks.

Design delight. It is memorable whenever we encounter something that is particularly well made or well designed for its purpose. A great design often catches us by surprise and we remember our first experience with it (Fletcher, et al. 2001).

A new car model has designed all the key controls for audio, navigation, and climate control into the steering wheel, just inches from the driver's fingertips. As the driver changes radio stations while keeping her eyes on the road she thinks how cool that is… a grin appears on her face.

Fourth graders are examining a multiplication table that arranges factors and products as a grid. The teacher shows them how they can use the table to check their multiplication facts up thorough 12 x 12 = 144. "Not bad" the students say as they get accustomed to using the table. Then, the teacher shows them how they can place two fingers on any two numbers that are vertically adjacent and trace a line straight back to the left side of the table to show any fraction's simplified form. "Wow, said one student. Can I take this home?"

End Notes

I once had the opportunity to participate in a leadership development experience that paired schools and businesses for the purpose of sharing ideas and strategies for success. The business partner I worked with was Hixson Architecture, Engineering, and Interiors in Cincinnati, Ohio. After a quick tour of the facilities, I sat down with Hixson CEO Wick Ach and asked him what leadership insights he might share that I could apply to education. His answer was surprising and memorable.

He walked over to the whiteboard and wrote four large letters- GPTW. He then tossed the marker back into the tray and sat down at this desk. "That's it" he said. "That's my strategy." He went on to explain that GPTW stood for Great Place To Work. Back at the whiteboard now, Mr. Ach drew a series of connected arrows like a flow chart. He explained "My job as CEO is to make Hixson a great place to work. If I do that well, (he drew an arrow from GPTW to the words 'best architects and engineers') I'll attract and keep the best architects and engineers. Over time, those architects and engineers will create satisfied clients (He connected 'best architects and engineers to the words 'satisfied clients'). Satisfied clients come back for repeat business. Repeat business drives our profitability (He finished with arrows to repeat business and then profitability). It's that simple," he said, "and it all starts with creating a GPTW."

He finished by saying "I'm not an education expert. But, if I was a school principal, I'd take the same approach. In fact" he said, "I'd draw it up just like this except I'd swap *great teachers* for *great architects and engineers* and I'd swap *student learning* for *profitability.* Everything else would stay the same."

I agree wholeheartedly. In fact, as I reflect on the thousands of observations and school visits that provide the basis for the *Artisan Teacher Field Guide*, I think I can now take the GPTW approach a step further and describe some characteristics of schools that attract and keep great teachers- *Artisan Teachers.*

Over time, some schools attract and retain more than their fair share of artisan teachers while other schools lose their most talented teachers. I've found that great teachers are not necessarily like athletic free agents, willing to go anywhere to play for the highest bidder. I have noticed, however, that they will drive past several schools closer to their home to find a place that suits their needs. What are they looking for? What school characteristics turn out to be most inviting for highly talented, artisan teachers?

Artisan Teachers Work Where They Are *Valued.*

What teacher characteristics are valued most at your school? Is it a teacher's good attitude, work ethic, local community connections, years of experience, or extracurricular activities? All these attributes are valuable, of course. A GPTW values teachers' instructional talents and skills above everything else.

Artisan Teachers Work Where They Are *Appreciated.*

One definition of appreciate is "*to be fully conscious of, to be aware of, to detect*" (dictionary.com), as in a person who appreciates modern art or fine wine. I believe talented teachers seek out settings where administrators know what great teaching looks like and understand the finer points and nuances of effective teaching.

Artisan Teachers Work Where They Are *Recognized.*

In artisan-friendly schools administrators regularly point out effective episodes of instruction. They provide immediate and specific feedback to teachers on their instructional moves and strategies. The key is to provide abundant, immediate, and specific recognition of teachers' talents, not in a general way as in "*nice job*," but specifically as in "*when you..., that caused...*"

Artisan Teachers Work Where They Can Be *Developed.*

Ultimately, the greatest attractor of artisanship is the opportunity for growth and development. Some administrators focus much of their classroom observation time on evaluation instruments or supervisory walk-throughs. Administrators in artisan-friendly schools focus their energies mostly on the development of teachers and teaching. They agree with that old Iowa proverb, *"You don't make the lambs fatter by weighing them more often. You make them fatter by feeding them."* Administrators who develop a reputation for developing artisanship will, over time, attract more than their fair share of it (Rutherford, 2010).

It is my sincere wish that the descriptions and illustrations of teacher artisanship contained in *The Artisan Teacher: A Field Guide to Skillful Teaching* will serve as a valuable, trustworthy, and easy to use resource for creating and sustaining a Great Place to Work.

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Appendix I: Illustrative School and Classroom Scenarios

Theme 1: Clear Learning Goals

Elementary – 3rd grade English language arts.

Mrs. Jones, a third grade teacher, uses the clear learning goals "window frame" to better target her lesson design. A language arts curriculum standard states, *The student will be able to sequence events from a story.* She used a window frame graphic to clarify the learning goal of her next lesson.

	Performance	Content
General	Apply	Language Arts Sequence a story
Specific	Identify errors Reorder	Chain of events from a shared reading of a short book

After completing the chart, Mrs. Jones wrote her learning goal into two student learning targets.

- *I can identify errors in a chain of events from a story.*
- *I can reorder the chain of events of a story to place them in the correct order.*

Mrs. Jones could use these student learning targets for other lessons to practice the same skills.

Middle – 7th grade history.

When Tom Rutherton analyzed the results of a 7th grade geography test he found that 22 out of 25 students answered the following question incorrectly.

Explain the similarities and differences between a ***delta*** *and an* ***estuary****. You can use a Venn diagram for your answer.*

Most of the answers had definitions of a delta and an estuary, but did not compare the two or the answer was blank. He questioned his class about the difficulty they had answering this question. He discovered that the students had learned the definitions of the required landforms (knowledge) because that is what he taught. He did not teach his class how to compare and contrast (understand/apply) landforms.

He then wrote a clear learning goal that better matched the level of performance to the specific task he wanted his students to perform. After re-teaching the skill, he gave the students a "redo" question.

Explain the similarities and differences between a ***lagoon*** *and a sound. You can use a Venn diagram for your answer.*

This time 21 students answered correctly.

High school – American history.

During their professional team time, the high school American history teachers often worked together to construct clear learning goals/targets for their history classes. They began by identifying more specific content topics from the general learning statements. Then they matched specific content learning with specific levels of thinking and doing. Below is an example their work in progress.

Standard: Understands *(general level of thinking and doing)* how slavery influenced economic and social elements of Southern society in the early 19th Century (*general content*).

Lesson Topics: (specific content) Economic and social development of Southern society between 1830 and 1860.

1. The South remained an agricultural society with a scattered population and few urban centers or factories (*specific content*).
    - Compare (*specific level of thinking*) the Southern economy to the growing industrial economy of the North.
    - Describe *(specific level of thinking)* how cotton plantations impacted the Southern economy.
2. Southern agricultural society depended on slavery. *(specific content)*
    - Summarize *(specific level of thinking)* the impact of slavery on Southern values, customs, and laws.

Theme 2: Congruency

Elementary – 3rd grade mathematics.

Students in a third grade classroom were learning how to divide objects into fractions. They had learned that the numerator is the number of parts selected from the whole and that the denominator is the total number of parts that divide the whole. Following a few whole class activities, the teacher passed out a worksheet for the students to complete individually. At the top of the paper were ten questions that asked the students to match fractions to a picture that illustrated the fractions. In the middle, the instructions were to draw a picture to illustrate five given fractions. There were ten more questions at the bottom. The directions for these last ten instructed the student to match pictures of different fractions that illustrated equal parts. The teacher told the students to complete only the top and middle sections. One student asked, "Why not do the bottom questions?" The teacher replied, "You will answer the bottom questions tomorrow, after we learn more about what they are asking you to do."

Middle – 6th grade science.

In a sixth grade science class the learning objective an intern teacher wrote in her lesson plan was: *SWBAT illustrate the relative scale of the layers of the atmosphere and their locations from earth.* The two learning activities she wrote to go along with this objective were:

Activity 1: The students will cut out the names of the five layers of the earth's atmosphere and glue them in the correct locations on the given picture of the atmospheric layers.

Activity 2: The students will place pictures of objects in the layers of atmosphere where they would commonly be found.

When reviewing the lesson plan, the cooperating teacher commented that the first activity was congruent to the lesson objective, yet the second activity was only correlated, and instructed her to think of another more congruent activity.

High school – civics.

Mr. Johnson, a high school civics teacher, had the following learning target on the classroom whiteboard: *I can explain the difference between a criminal law and civil law court case.* For the learning activity, he divided the class into pairs and gave each two news articles, marked #1 and #2. The student pairs also received a chart to complete. He instructed the students to read the articles and fill in the chart. He told the class the first article was about a civil case and the second was about a criminal case.

1.	2. Article Civil Case	3. Article 2 Criminal Case
4. Who are the parties involved? Circle the party that brought the case to court.	5.	6.
7. Describe the issue that the court must decide. (What is the nature of the case?)	8.	9.
10. What is the penalty or remedy being sought?	11.	12.
13. What must the defendant(s) prove to win the case? (Burden of Proof)	14.	15.

A class discussion about the chart and correct answers followed the work time. Mr. Johnson felt very good about the students' level of understanding related to the differences between criminal and civil court cases. He then gave the following homework assignment:

Imagine that you are a law professor. One student submitted this summary about a ***criminal case****. Obviously the student does not understand the* *difference between civil and criminal court cases. Use your knowledge about* ***criminal court cases*** *and correct this student's summary.*

The next day the class reviewed the homework. Mr. Johnson was surprised at the difficulty his students had with the assignment. Many students could not identify what information to correct. So he decided to redo the activity together. Student understanding appeared to increase as they discussed the assignment together. Mr. Johnson realized the mistake he made with the homework assignment. The day before he had only introduced the difference between criminal and civil court cases at the *knowledge/understanding* learning level. The in-class activity was congruent to this level. Yet the homework assignment he gave asked the student to *analyze and apply* their learning. They needed more learning activities to build from *understanding,* to being able to *apply and analyze* the concepts. With this clarity, he decided to have the students read more court cases from online sources and practice identifying *(understand and apply)* whether the case was civil or criminal.

Theme 3: Task Analysis

Elementary – kindergarten language arts.

Portia Green, a 2nd year kindergarten teacher was frustrated by not knowing how to teach students who recognized letter names, but could not identify the letter sounds. Simply presenting the letter and repeating the sound in different activities was not working for several students. She decided to research the "task analysis" for sound-letter recognition.

Searching online she found different resources which emphasized that phoneme awareness was a critical early reading skill, but that this skill involved more than just identifying letters and their sounds. From her readings she concluded that hearing word and letter sounds, and "playing" with the sounds (such as in alliterations and rhyme) were also early phoneme awareness skills. Using this new understanding, she started a task analysis for phoneme awareness.

- Recognize individual sounds in words - *What sound do you hear at the beginning of sit? What sound do you hear at the end of water?*
- Recognize the same sound in different words - *Which words have the same sound at the start of the word: table, snail, top?*
- Recognize the odd sound in a series of words - *Which word has a different sound at the end of the word: bottom, opossum, jump, mom?*
- Hear separately spoken phonemes and bend them into a word - *What word do the sounds d/o/g/ make?*
- Break a word down to its separate phonemes - *What sounds do you hear in the word mat?*
- Identify what remains of a word if a phoneme is deleted - *What sounds are left if you take the /p/ sound away from the word pat?*
- Make a new word by adding a phoneme - *What word do you make if you add the /b/ sound to the beginning of /at/?*

- Substitute one phoneme for another to create a word - *What word do you make if you change the /t/ sound in cat to the /p/ sound?*

This list helped Portia design lessons to teach students to "hear" sounds. She discovered that most of her students who could not identify individual letter sounds, had difficulty isolating phoneme sounds they heard. Now she knew how to write intervention lessons for these students.

Middle school – math.

Mr. Goulds knew that a task analysis helped him to plan and sequence his math lessons. One day he decided that the idea of a task analysis might help his students solve the multi-step algebraic problems that seem to frustrate them. He began the class by having small groups of students write the steps to make a peanut butter and jelly sandwich. He randomly chose one set of directions to follow. When he tried to spread the peanut butter on top of the jelly, as the directions stated, one student commented that his groups' instructions explain that it is easier to spread the jelly on top of the peanut butter. Mr. Goulds used that point to introduce the term task analysis. He then had the same student groups solve a multi-step algebraic problem and write a task analysis to solve the problem. Using ideas from all the groups' work, the class developed a task analysis to solve multi-step algebraic problems. Mr. Gould made a poster of the work and displayed it on the classroom wall. It became a valuable tool to use. Students often referred to it, and Mr. Gould could use it to ask a student who was having difficulty, "Did you do step…?"

High school – music.

Many band students in Mrs. Perterlonia's class did not do a good job at cleaning and maintaining the condition of their instruments. At the next full band rehearsal session she asked all the similar band instrument groups to meet together. Then she instructed the more experienced students to demonstrate to the others how they cleaned and maintained their instruments. Following the demonstrations, the less experienced students had to clean their instruments while the more experienced students watched. She instructed the experienced students to provide corrections and useful tips as they watched.

The next day while the more advanced students practiced a musical piece, Mrs. Perterlonia had the less experienced students again group together by instruments. They were instructed to write a task analysis for cleaning and maintaining their instruments. This process worked so well she shared the idea with the middle school band instructor.

Theme 4: Diagnosis

Elementary – 2nd grade science.

In the computer lab, Mr. Franks explained to his 2nd grade class that they were starting a science unit on the mouth and teeth. He then directed his students to go to a web site that had a short video of the parts of a tooth. At the end of the video was a quiz. The students were instructed to take the quiz and record the information they knew and did not know. Mr. Franks explained that when they returned to the classroom, the students would use the results from their quizzes to identify the critical concepts about teeth they needed to learn. Mr. Franks often used similar activities to help his students take ownership of their learning and increase motivation for learning.

Middle school - health.

When the students walked into their middle school health class, they were given a number from 1-6. They formed groups according to the numbers. Each group received a statement to discuss and share what they thought about the statement.

- *Don't swallow gum because it takes seven years for it to digest.*
- *Too much sugar causes hyperactivity.*
- *Cracking you knuckles causes arthritis.*
- *You can catch a cold from not wearing a coat and hat in cold/wet weather.*
- *Wait 30 minutes after eating before swimming.*
- *Chocolate and fried foods cause acne.*

The teacher learned from this opening activity that her three health classes had different levels of understanding about these medical myths. This allowed the teacher to choose how to start the new unit on medical propaganda. The objective of the unit was to teach students to gather and compare data from different sources to help make informed decisions about nutrition and medicine. One class had a large percentage of "myth believers." With this group, she decided to start by instructing the students to research the original six myths. Her other two classes demonstrated more skepticism of the statements. With these classes, she decided to share the facts briefly about the original six myths, and then have these students move on to research other medical myths.

The next day the classes shared their discoveries. She was pleased with her choice, because the class with the "myth believers" searched several sources before they were ready to concede their original beliefs. This same process was unnecessary with the other two classes. Those classes enjoyed discovering the truth about other myths. Now all her students had more open minded and "skeptical" views of broad nutrition and health related statements/beliefs that can affect sound decision making, and she could continue on with the lessons in the unit.

High school – algebra.

Sara Biggles has discovered some common errors and misconceptions that students have developed during lower level math classes that cause problems in algebraic thinking. At the start of her third year, she decided to give a pre-test to identify students' misconceptions and then begin the course by assigning students to specific "work stations" to clarify and correct their misconceptions. Students who do not need to complete the stations, or needed to complete only a few, were assigned as station managers, as tutors for classmates who needed help.

Theme 5: Overt Response

Elementary – 1st grade language arts.

First grade teacher, Sonya Reynolds, typically had students answer individually or in a choral fashion when learning about rhyming words. After learning more about the importance of obtaining overt responses from all her students, she made index cards that had various illustrations of words that rhymed. She placed one picture on each card and made ten student sets of different rhyme families. She now could use the card sets in small groups or with whole class. The students could discover picture rhymes or she could call out a word and have the students find an illustration of a rhyming word. This provided a fun and easy technique to monitor each student's understanding of rhyming.

Middle school – physical education.

Mr. Thompson typically doesn't have difficulty eliciting overt responses from all his students simply because of the physical nature of his classes. Yet, when the students need to learn the rules of a game, he struggles with engaging activities. He shared this concern with his PLC team. The languages arts teacher shared how she uses "inside-outside" circles. Ten students form an inside and an outside circle, with five student pairs facing each other. Each pair of facing students quiz each other with questions they have written. After a designated time, the outside circle moves one space to create a new pair and the process repeats.

Mr. Thompson used this idea for his next lesson. He had each student write two brief game scenarios describing a "game play" from the sport. They could write about a legal or an illegal action according to the rules of the game. If they included an illegal action, they had to know the type of foul and its name. The class formed inside-outside circles, and read the scenarios to their partners. The partner had to decide whether the play was fair or illegal. Illegal actions had to be named and explained. Mr. Thompson could now monitor his students' thinking and understanding of the rules by listening to the discussions as he walked around the circles.

High school – health.

In a high school health class, the unit on the skin included learning about skin cancer. As the class learned about the layers and functions of the skin, each student built a model of the skin using materials such as sponges, fabric, and yarn. Next, student pairs worked together to research the effects of the sun and skin cancer. Then, the pairs helped each other modify their skin models to include a skin cancer. One model had to illustrate the early stage of the skin cancer, and the other a more advanced stage. The teacher could monitor student learning by interacting with the pairs as they worked, and assessing the final products that showed how they changed their models to include a skin cancer.

Theme 6: Mid Course Corrections

Elementary – kindergarten mathematics.

Ms. Randall has eight students in her kindergarten class that have mastered shape identification. To provide an extension for these students she developed an activity using images of three abstract paintings that included circles, triangles, and rectangles. She shared the images one at a time and asked students to locate specific shapes. The students had no difficulty finding the circles in the first painting that had circles inside and over-lapping each other. Nor did they have trouble finding the different shapes in the second painting. Most of the shapes in this painting were separated from each other. The third painting had the same three shapes around, in, and through each other.

When Ms. Randall asked the students to find the circles, triangles, and rectangles they only found the separate and more obvious shapes. The students did not identify the many shapes that overlapped and shared spaces. She specifically noted that they had trouble finding different shapes inside other shapes. Such as the triangle inside the circle. Instead of continuing her lesson as planned or simply pointing out the other shapes in the painting, she decided to abandon continuation of the lesson she designed. Instead she introduced the concept of different shapes inside each other. She drew a circle then drew a triangle inside the circle. When the students correctly traced both shapes, she drew a rectangle inside the triangle. When the students could distinguish all three shapes, she asked if someone could draw a circle inside the rectangle. She followed the same process with two more drawings. Finally, she had her students create their own "shapes in shapes" drawings. She decided she would show the third painting again tomorrow and assess whether the students were more successful at locating all the shapes.

Middle school – 6th grade mathematics.

Emily Rice showed her students three short video clips. The first showed how a dancer used geometry, the second explained how a veterinarian used statistics, and the third illustrated how a backpack designer used ratios.

She then divided the class into groups of four and asked the groups to discuss how math concepts were used in each profession. Ms. Rice noted the limited number of connections her students made as she walked around and monitored the group's discussions. She thought perhaps she presented too much information at one time that blurred the connections.

She stopped the group discussions and played the first video again. As the video progressed, she paused it at various points and identified connections with math. She probed students to share their thoughts about these connections. She did the same thing with second video, although when she paused this video she did less explanation and asked for more student input. Finally, she showed the third video again. After this one, Ms. Rice asked the groups to meet and discuss the math connections the third video illustrated. The group discussions were now more focused and more accurately identified connections. Ms. Rice made a note to herself that her students need more guidance at making connections between math and other subjects.

High school – 10th grade music.

Frances Killinsworth's 10th grade chorus was rehearsing a song for the winter concert. The song contained some parts at the higher scale of their vocal sections. Mr. Killinsworth had modeled how to use vowel modifications for some words in these higher parts in order to make the voice tone better. However, as the students rehearsed the entire song they still demonstrated difficulty forming the sounds correctly. He stopped the rehearsal of the song and wrote the phonetic sounds to sing on chart paper, not the actual spoken pronunciation of the words the students were singing incorrectly. He did this to clearly illustrate the pronunciation they should sing for each word. They practiced singing the words up and down the music scale using the modified pronunciations. He then had the chorus sing isolated parts of the song that contained the words. Mr. Killinsworth knew that if he stopped rehearsals to practice the mispronunciations as they occurred, he increased student success because he prevented practice of incorrect and poor tone. He wanted his choral students to successfully recognize and use good voice quality.

Theme 7: Conscious Attention

Elementary – 3rd grade science.

When Miss Loo's 3rd grade students returned from physical education class, they saw several plastic dinosaurs on the front table. As they took their seats, the students started discussing what they knew about dinosaurs. Miss Loo then made the statement, "Many scientists thought they knew a lot about dinosaurs, but discovered they were wrong." Her students stopped talking and just stared at her. "Scientists make inferences, or hypotheses, from facts they have at a certain point in time. Later when new facts are discovered scientists have to sometimes change what they first thought." Miss Loo then read various examples of ideas about dinosaurs that had to change as new discoveries were made. This activity was Miss Loo's introduction to the scientific process, and she had her students' attention.

Middle school.

Mr. Edwards had a typical teacher's bell on his desk. Yet he never used the bell in the typical "Ring, ring, ring, ring…" manner that teachers often used to gain students' attention. He called the bell the *"Brain Ding."* Whenever he rang the bell, with just one "DING" it meant that what he just said, or what a student said, or the concept just conveyed - was a very important learning idea - or *Brain Ding*. Mr. Edwards always allowed a few moments of silence after the ring, and would ask why he rang the bell. The bell did not ring often, but when it did his students would pause and rerun in their minds what they just experienced or heard.

High school – American history.

The learning objective for Janice Mellow's American History I lesson was: *Identify important arguments for independence made in Thomas Paine's Common Sense and explain why these arguments helped persuade American colonists that independence was necessary.*

Miss Mellow knew that reading historical documents could be very difficult and "boring" for students. So she started this lesson by sharing stories about criminals with no 'common sense' to illustrate the concept of common sense in a fun manner and to get her students thinking about common sense. Then, in small groups, the students read and discussed the historical document. She divided the document into parts, and gave only one part at a time to the groups.

After a designated time, the class discussed the separate parts of the document. They focused on the common sense arguments. She also included arguments from contemporary newspaper articles. The newspaper articles illustrated different public views about the common sense relating to various current events. Breaking up the historical document study with discussions about more current illustrations of the concepts helped to refocus and maintain her students' attention.

Theme 8: Chunking

Elementary – language arts.

Early in the school year, Mrs. Jackson showed her students a random list of 50 spelling words and told them that it was the first set of words they had to learn, and they had a month to learn them. At first all she heard was groans. Then one child commented, "We could learn a few at a time." Using that thought the other students began sharing ideas about how to break the list into smaller segments. Finally, Mrs. Jackson stated, "We need to come up with a plan for how we are going to learn all these words. I want you to get with your think partners and decide how you would divide up the list and explain why."

After the students worked on this, they shared ideas. Some students just divided the list into equal amounts of words starting from the top. Others put words together that started with the same letters. Some partners grouped the words by common phonetic elements, like the long e sound or silent e words. When she asked the class to choose a class method to divide the list, they agreed that it would be easiest to learn the words when they are grouped together by phonetic elements. Then they set about placing the smaller wordlists on the calendar for the next month. They would pace learning all the words according to the calendar they created.

Mrs. Jackson could have just given the students the words in small groups from the start. The purpose of this activity was to get her students to recognize the value of chunking as they learn.

Middle school – 7th grade dance.

Mr. Kennan showed a video of a five-minute dance that his class would learn. He asked the question, "How would you go about learning this dance?" The students shared they would break the dance into small parts and learn one at a time. Then he asked, "Would you break the dance into equal time parts? Why?" At first the students thought it would be easiest to just divide the dance into equal time parts. Then further discussion led them to understand that certain movements would be easy to learn together, but the movement segments might be different lengths.

Then Mr. Kennan asked, "What would be the first part you would learn, and why? What would be the second part, and why?" In pairs, the students had to decide how and why they would divide the dance into parts to make it easier to learn. The students immediately recognized it would be easier to learn the dance in small chunks. Yet, they had not thought about logical ways to divide the dance, nor if rearranging the practice order of the dance segments might make the overall mastery easier. This is the thinking Mr. Kennan wanted his students to apply to their practice.

High school – environmental science.

Mr. Jeggan often has students in his earth/environmental science classes use non-fiction journal articles to learn new information. This is not easy for his high school students. So at the start of each year, he teaches his students a note-taking strategy using a graphic organizer. The organizer provides divided sections for main topics, and supporting details. It provides an efficient way to organize information gathered from assigned text. At first, Mr. Jeggan helps the students to identify the main topics of articles and to "chunk" together the details. The students use the graphic organizer throughout first quarter. Then, as his students become more skilled at chunking together ideas and facts from non-fiction resources, the graphic organizer he provides becomes less and less structured.

Theme 9: Connection

Elementary – 1st grade art.

To help his first grade visual arts students understand the concept of still life art, Mr. Krajack begins the class with a game of Simon Says. The game includes the instructions run, hop, and be still. Following the game, he asks students to explain the meaning of "still." Next, on the front table, he uncovers an arrangement of peaches, pears, and a dish. He asks, "Could these fruits play the Simon Says game we just played?" The students laugh and call out, "No." Mr. Krajack asks, "Why not?" The students explain that the fruit cannot move; it can only be still. He shows the students a painting, which looks very similar to the arrangement on the table. He explains that when an artist paints a picture of objects that cannot move, it is called a still life. Then he shows them examples of other 'still life' art using various materials.

Middle school – 6th grade mathematics.

Ratio is a difficult concept for 6th grade students. To help her students understand ratio, June Billingsly uses a video clip that illustrates how ratios are used to increase or decrease the ingredients in recipes depending on how many people need to be served. Following the video, she has her students use ratios to convert fun recipes like dirt pudding made from chocolate cookies, gelatin, and candy worms. Since her students are more familiar with food measurements, recipes, and serving numbers, they have less difficulty using ratio to alter the recipes.

High school – 11th grade civics.

In her 11th grade civics class, Mrs. Marghetti's students learn about the role of local governments in zoning laws. She always starts this unit by sharing various photographs of locations around the school community and local towns to explain the different zoning categories, such as residential and industrial. She continues to use photos of familiar and popular locations as she shares some "what if" scenarios to explain how zoning laws are meant to protect the integrity of the zoned area. The first scenarios she presents are of obvious situations. For example, "Should the owner of the downtown recreation building be allowed to tear the building down and use the space for a garbage dump?" Then she presents photos and scenarios that are not so obvious. "What if a person who owns a large lot in the Smithstone neighborhood wants to sell some of the land to a telecommunications company to build a cell tower? Should the person be allowed to sell the land to the company?" The photos and questions are intended to help her students understand zoning and to get them talking about the pros and cons of zoning laws.

Following these discussions, she shares a current zoning disagreement from the local community. The students will then research more about the situation and eventually write an opinion paper on the pros and cons of zoning laws. Using local examples makes it easier for the students to relate to the zoning concepts.

Theme 10: Practice

Elementary – 1st grade language arts.

Mrs. Hanson's first grade students love to practice their sight words because the practice is always fun. During their learning center time, there are always one or two sight word games. One is usually a group game like Bingo Words, Go Fish for a Word, or A Candy Land of Words. Other games are for pairs or individuals to play. These games include Concentration Words, Fish the Bowl for Words, SWAT that Word, and different computer word games. Students repeatedly ask for games to be included in their center time, especially SWAT that Word. They love to use the fly swatter to type out the sight words on the giant size plastic keyboard. To provide more practice, Mrs. Hanson has also made "take-home" packets for many of the games. Her students can borrow a take-home game to play with parents, grandparents, and friends.

Middle school – 8th grade language arts.

Mr. Davies knows there are many vocabulary words, definitions, and concepts (like nucleus, chloroplasts, mitochondria, vacuoles, potential energy, kinetic energy, etc.) that his 8th grade science students must learn and remember throughout the semester. Every Tuesday and Thursday he has "POPcorn" quizzes to enhance their practice with these terms. The students' scores are not recorded as grades, but rather as "kernels of knowledge" and students keep track of their own knowledge levels. Every correct answer is worth one kernel. There are different levels of achievement.

As students reach different levels, there are awards to earn, such as homework passes and science comic books.

Mr. Davies has found that not grading these practice tests creates an opportunity for students to self-monitor and set goals without grade penalties. He has found these regular practice challenges have resulted in higher scores on the graded unit quizzes and tests. When the class average on a graded unit test is 80% or higher, the class celebrates with POPcorn treats!

High school – Spanish 1.

Students have a lot of vocabulary to learn without a wealth of knowledge, experience, or schema to make connections. Señora Delgalious understands that short, high, quality practice, distributed over periods of time is most valuable for initial learning of the vocabulary. She also knows that her students do not get enough time in class for the necessary number of practice sessions. Therefore, she designed and recorded a series of podcast homework practice sessions. Each student receives a schedule for a series of podcasts that they can listen to directly from the school web site or download onto an audio player. The podcasts provide the students with directed practice that controls the amount of time, and the number of words to practice during each session. The students hear the correct pronunciation for each word, along with hints about how to form the correct sounds for difficult words. The podcasts are guided practices that help students increase the quality of practice.

Theme 11: Personal Relevance

Elementary: 2nd grade technology.

Internet safety is one of the first lessons Ms. Stalick teaches her second grade students in the computer lab. She knows using the computer is very relevant for children, but internet safety is not an interesting topic and a bit abstract for 2nd grade students. To make this important topic more relevant for her students she starts the class by showing a short animated cartoon video on internet safety.

The video is a cartoon comedy that shows all the bad things that happen to one of the characters when he does not follow important internet safety rules. Then she has her students follow two important rules shared in the video. The first is how to use a password to log onto the computer and the importance of keeping the password secret. Before each student receives his password he must review with a partner all the problems the cartoon character had when he shared his password.

The next rule is to only go to web sites that the teacher instructs you to use. Again they review with a partner what happened in the cartoon when the character did not follow this rule. Then, Ms. Stalick directs the students to a game web site where they have to follow specific directions about how to use the computer correctly and safely in order to advance in the game. This gives the students time to use the computer and learn about important computer rules. When they follow all the rules and win the game the students earn an internet safety certificate.

Middle school – 6th grade mathematics.

A standard in 6th grade math involves solving real-world mathematical problems using area, surface area, and volume. To get her students more engaged in lessons addressing this standard, Ms. Hammerstein uses different map and atlas sites available on the internet. She has her students locate interesting places that coordinate with their 6th grade social studies lessons and local places of interest. Using a program that allows the students to zoom in on a location, she asks them questions about specific characteristics they see. Then, using other programs that allow the students to superimpose 2D and 3D shapes on top of the maps or images, she asks the students questions that require them to apply formulas to calculate the perimeter, area, complex area, and volume of 2D and 3D images. She explains how civil engineers use similar tools in their jobs. The students are intrigued about analyzing the real-world locations, particularly ones in their own towns, and they feel like real engineers.

High school – honors biology.

High school honors biology students study microbes and their characteristics. Mrs. Stuart knows that microbes are not very relevant to her high school students' lives. After a very brief introduction to microbes Mrs. Stuart asks her students to take the microbe personality quiz at the Center for Microbial Oceanography: Research and Education web site http://cmore.soest.hawaii.edu/education/kidskorner/microbe_quiz.htm The results intrigue the students and they start teasing each other about their microbe personalities.

There are laminated nametags of all the "personality types" on the front table. Mrs. Stuart tells the students to take a nametag and partner with someone who has the same personality. She directs the students to research their microbe and determine why the quiz assigned them that particular microbe personality.

Theme 12: Locale Memory

Elementary – 5th grade social studies.

Sara Penerro used the 36' x 48' United States map that the PTO painted on the school playground in many ways with her 5th grade students. Today various groups used chunky blue chalk to draw in the major rivers. When all the students were finished, each group had to "walk" the entire class down their river, identify the states they passed, and share other facts they had learned about the river.

Middle school – Spanish I.

Mr. Jeffery planned an active way for his Spanish I students to practice vocabulary and doing/action verbs. He divided the class into groups of three and gave each group a starting clue. The clues were in Spanish and sent the students to various locations and people around the school. Some clues led them inside an empty locker, under the school mascot, or above the visitor sign in the lobby. Other clues involved school personnel, such as the school nurse.

When the students went to a person, they received another clue that instructed them to sing, jump, bark, or perform some action before they could receive the next location clue. All the clues eventually led the students back to the classroom for the scavenger prize… a dish of flan. As the students enjoyed the treat they "complained" and laughed about the places they went and actions they performed, such as: *Cante Centelleo, Centelleo, Estrella Pequeña para el secretario.*

High school – physics.

Ms. Cuellar always begins each semester of her high school physics class reviewing the basics of important physics laws (center of gravity, momentum, rotational inertia, torque, etc.) that her students have learned, but may not recall. The students remember the review all semester because during the first week of the class she takes her students to a nearby elementary school playground. The swings, slide, monkey bars, jump rope, and balls are the instructional materials. As the students interact with the playground equipment, Ms. Cuellar reviews applicable physics laws. The following day, student groups make a poster of an assigned playground item. On the poster, they record the physics laws that were demonstrated at the playground. These posters are displayed on the classroom walls and throughout the semester, Ms. Cuellar often refers back to the playground adventure, "Remember when you…"

Theme 13: Mental Models

Elementary – 5th grade science.

In a fifth grade classroom the teacher has selected two images that clearly illustrate the concept of wind. The first picture depicts a powerful, fierce, potentially destructive wind. The teacher instructs the students to observe the first image and write descriptive words. Then, she has them observe the second picture that illustrates a gust or strong draft, but not a fierce, destructive wind. Again, the students write descriptive words. The teacher then assigns the students to work in pairs to define wind and the effects of wind. Now the students have a mental model of the different forces of wind as they start the unit.

Middle school – history.

An American History teacher uses the "Story of H.I.P. Pocket Change" as focal point for the course. He directs students to the United States Mint *History in Your Pocket* web site http://www.usmint.gov/kids/campCoin/timeline He refers to the web site's timeline to start each time era. The teacher connects each new era to the people pictured on the coins, and the historical events during the peoples' lives that impacted the development of United States currency. This consistent theme helps the students create a mental picture of the time span of the eras and provides an image to connect with each era.

High school – physics.

Students listen in a physics class to the same musical note (A) played on a flute and a violin. The teacher asks the students to describe how each sounds the same and different. Then the teacher explains that when you play a note on a flute, you are only producing one particular tone. When you play a note on a violin, you are not only producing that tone, but numerous harmonic tones as well. He continues to explain that harmonics are waves at proportional frequencies, and at inversely proportional amplitudes. If you play an "A" (440hz) with harmonics, like on a violin, you will not only hear the 440hz tone, but also an 880hz tone at half the volume (first harmonic), a 1320hz tone at a third the volume (second harmonic), a 1760hz tone at a quarter of the volume (third harmonic), etc., until the frequencies get too high or the volume gets too low to be heard. Other notes are played on the different instruments and the concepts of wave frequency, amplitude, and harmonics are discussed. This demonstration helps the students conceptualize these concepts as they learn more about them and begin to use formulas to solve problems.

Theme 14: First Time Learning

Elementary – kindergarten English language learning.

Miss Call's kindergarten curriculum contains many concepts her students are encountering for the first time. Learning, trying, and sometimes failing while others are watching is a very new experience for most of her students. This can be a deterrent to learning if students become unwilling to try because they are afraid to fail.

Miss Call uses two puppets, Ruby (the Rottweiler) and Roger (the Rocky Mountain Horse), to help teach her students about "learning to learn." Every morning at circle-time, she shares a short story from the perspective of the characters, like when Ruby tries to fly like a bird and the barn cats laugh at her, or when Roger tries to count by stomping his hoof and has trouble recognizing the difference between 6 and 9. Ideas come from personal experiences and experiences from working with children. The students love the short, simple stories about feelings, learning, fears, and joys told by the animals. Sometimes, later in the year, Miss Call and her students refer to a story that is pertinent to a moment in the classroom. "It's O.K. to mix up your letters as you are learning Robby. Remember when Roger…"

Middle school – 7^{th} grade language arts.

"Life doesn't exist in a vacuum." "What do you think that means class? John?" John answers, "That people are surrounded by things and the things get sucked into their thoughts." "O.K., Let's explore more about what you mean." This was the flow of a discussion in Mrs. Johnson's 7th grade ELA class as they read a book based on this idiom.

Upon reflection after the class, she was struck by the fact that her students thought a vacuum "sucked-in" things, not that items are pulled as higher air pressure flows into a space with lower air pressure. She knew this was a misconception that could interfere with their future understanding of the events in the story. She decided to take the opportunity to correct the misconception.

She went to her middle school team's science teacher and explained how the topic of vacuum presented in her class. They decided to switch classes the next day. The science teacher taught a mini-lesson on "how vacuums work" and Mrs. Johnson led a reciprocal teaching activity with a science article. Later when the class was further into the book, Mrs. Johnson re-introduced the idiom, "Life doesn't exist in a vacuum." Her students were able to more creatively and more accurately apply the idiom to the events and characters in the book.

High school – art.

Mr. Vilacmer's art class was ready to throw clay on the potter's wheel. They had learned about preparing the clay, the wheel and its parts, and the basic elements about throwing a pot. Until today, no student had actually used a wheel with clay.

The first and critical skill is to successfully center the clay. Since there are only three wheels in the art room, Mr. Vilacmer chose to demonstrate to the whole group how to center the clay. He specifically highlighted important actions to be successful at throwing the clay on the center of the wheel and molding the clay into a centered shape. He shared a poster that had a photo to illustrate each action. When he demonstrated the correct shapes the students should form to center the clay, he gave each shape a name. He called them the gumdrop and bullet. The named shapes provided clear, concrete pictures of the shapes he wanted the students to attain.

He also demonstrated some shapes they should not make, such as the volcano and mushroom. As he did this, he pointed out the errors that typically cause these shapes and how avoid the errors. Then, the students went to work. In groups of three at each wheel, they practiced and coached each other on how to correctly center the clay. The students often referred to the poster as they helped each other. In addition, Mr. Vilacmer circulated and asked questions to reinforce the learning. He often gave guidance by simply asking, "Is that a bullet or a mushroom?"

Theme 15: Neural Downshifting

Elementary – 1st grade language arts.

Spelling is hard for many first grade students because they are just learning to read and write. Miss Heinz did not use the typical weekly spelling list process in her classroom. She felt that process was stressful, wearisome, and often self-defeating.

She called her spelling program the *Alien World of Words* game, a learning process that used video game characteristics. She created lists of eight words, each at a specific difficulty level organized by phonetic sounds and common sight words. She had several lists at each level, with high-frequency words repeated throughout the lists. She has each student design and name a personal avatar for the game. The goal of the game is to have your avatar save the school by outsmarting the aliens from the World of Words. Each child receives an *Alien World Travel and Challenge Card* and a special silver pencil as their first "tool". Everyone starts at the first level. Avatars move up levels by earning coins on *Alien Word Challenges.* Each correctly spelled word on a challenge earns one coin. Each level has a specified amount of coins to earn in order to take the *Ultimate Challenge* at that level. To pass the *Ultimate Challenge* the student has to spell five random words chosen from the level. Any avatar that gets stuck at a level (failing the third attempt to pass a level) goes to the *Queen of Word Smarts Training Camp* for assistance with conquering the level. So avatars are never "lost in the alien world."

There are also fun surprises after completing a group of levels. For instance after passing the fifth level, the player becomes a *Challenge Tester* and learns how to help the *Queen of Word Smarts* (Miss Heinz), give and score classmates' word challenges. When the twenty challenge levels are conquered, the avatar becomes a *Prince or Princess Word of Smarts.* To keep the title, once a month the avatar must pass a *Smarts Word Challenge* that consists of eight random words from any level. The prince or princess must redo level twenty if they do not pass this challenge. This self-paced, challenge game takes the stress and monotony out of learning to spell. The only problem with the game is that Miss Heinz often received complaints from parents about their children constantly asking practice help for the *Alien World of Words*!

Middle school – 6th grade math.

It is common for Mr. Jarrod to have two to three Spanish ESL students in his sixth grade math class. Much of math is an international language. Yet, if the ESL students cannot understand the instructions then they still are lost and frustrated. To combat this he created an English-Spanish vocabulary list of common math terms and directions. He included terms that are necessary for his math curriculum, like ratio, decimal, and predict. He uses the list as a communication tool with his ESL students. He points to a term and he says it aloud. Saying the word aloud allows the students to hear him "sound funny" speaking Spanish. This helps the ESL students be less self-conscious about trying English.

He made several laminated translation cards and has them available for anyone to use. He encourages non-ESL math students to use the cards and terms as they work together with an ESL partner. It is a joy to hear laughter from ESL students as their non-Spanish speaking partner try to say the Spanish words. Over time, Mr. Jarrod added to the lists because his ESL students made valuable suggestions for other words to include. He also made a few poster-size charts with the most frequently used words and terms. He and the all the students can refer quickly to the posters during class activities. Mr. Jarrod is delighted that ESL students seem more willing to try and to ask questions in his math classes.

High school – business and marketing.

As a first year teacher, Miss Chen did not want to fall into the 'teacher on the stage' trap. She had a large business and marketing class, and it was easy to use lectures to present facts directly and logically. Also as a new teacher, she often used a presentation software program to help her recall the lesson material and pace the lesson flow. She did not want her instructional needs to overtake her students' learning needs. She had learned in her undergraduate coursework that boredom causes stress, and stress can trigger neural downshifting. Listening to a teacher lecture, even with projected images, can soon become boring.

Therefore, she posted the rule: "For every 10 minutes of lecture, allow for 2 minutes of information processing" on her classroom wall, and explained the meaning to her students. She committed herself to include different processing activities like drawing mental models or thinking aloud with a partner whenever she used lecture in her class. Whenever she broke the rule, her students were quick to remind her that they needed time to process the information.

Theme 16 – Enriched Environments

Elementary – 2nd grade social studies.

Second grade teacher, Elana Shank, understands the importance of creating an environment where students feel welcome. On the first day of school she shares with her students an *All about Us*, photo album style book and explains how each student will add a page. Ms. Shank shows the completed first page that is all about her. On it are family pictures, pets, the title of her favorite book, her favorite foods, a funny story about her, and statement about how she plans to be a positive member of the class. During the first week of school, Ms. Shank sends home a letter to parents/guardians to ask them to discuss their children's book entries and gather some photographs or to email her digital photos. During class time the students complete their own pages using a computer template to add information and pictures. If a student does not bring pictures from home, for whatever reason, Ms. Shank takes digital photos at school and encourages the student to add drawings. Once the book is complete, the students take turns bringing the book home to share with their families. Ms. Shank has found this book becomes a wonderful tool for developing the feeling of a classroom family.

Middle school – 7th grade science.

Miss Foreman knows that thinking and performing as a scientist is important for success in her 7th grade science class. Participating in actual lab experiments is an important part of this formula. Yet, most seventh grade students have not actively participated in real science experiments using a lab station. This lack of experience can cause a lot of problems when a whole class is spread out at labs around a classroom.

Miss Foreman has met several science teachers who continue to demonstrate lab experiments, rather than allow students to work at the labs because they want to avoid all the problems. So to establish a real environment of thinking and acting like a scientist, Miss Foreman introduces lab procedures using simple experiments during the first week of school in a very controlled and positive manner. She divides the class into small lab groups of three to four students. She has ten different lab activities and the student groups rotate through each. One station is learning the lyrics to a lab safety song and completing a review sheet that goes with the song. Another instructs students to watch three short lab safety videos and rate each according to a given rubric. There are others to practice measuring liquids, measuring mass, and reading graduated cylinders. Eight stations are designed for indirect supervision of small student groups learning lab procedures; two stations are lab experiments using procedures that require direct supervision from Miss Foreman. It takes two days for all the groups to rotate through each station.

The next week, the students rotate through similar learning stations that are coordinated with the first science topic. This time there are eight learning stations. Three of these are groups conducting a lab activity with Miss Foreman's supervision. The next lab activity day has four small group stations, and four groups working on a lab with Miss Foreman. This process continues through the first two months of school. Each time the number of students performing actual experiments increases. By November of the school year, each student has safely practiced, with close guidance, all the critical lab procedures; and Miss Foreman is very comfortable having the entire class performing experiments at lab stations, all at the same time, throughout the rest of the year.

High school – English.

Dynamic discussion is a valuable thinking and learning tool in Max Ruby's high school English class. To ensure that all students are involved and feel comfortable sharing their ideas, he uses many different protocols for small and large group discussions. Mr. Ruby has found that using a structured and inclusive dialogue process, such as a protocol, builds an atmosphere of intellectual safety. This is especially important at the start of each semester.

Theme 17: Success

Elementary – kindergarten.

Mrs. Porter loves teaching kindergarten children. Her students usually bubble with motivation and willingness to try. Therefore, when she notices a child not showing effort during a learning activity, she immediately questions why. Is the task too difficult? Does the child perceive the task to be too hard?

That's when she turns to one of the kindergarten puppet friends. With puppet in hand, she will go to the child that is showing no interest or effort and say, "Billy the Bear doesn't feel like sorting these pictures today either. I wonder why? What do you think he will say if I ask him why?" More often than not, the student's response gives Mrs. Porter some insight to why the student is not participating, or not trying.

Using this process, Mrs. Porter can make instructional adjustments to get the students to try harder. Sometimes it just takes helping the child start the task, or breaking the task into smaller steps with encouraging words as each step is attempted and completed. Maybe it is asking another student to be a helper, or reminding the student of the purpose of the finished product.

Kindergarten children show their emotions all over their faces. When Mrs. Porter sees smiles, she knows her students are feeling the success of learning. When children experience success, she is on the right path to getting more effort from every child.

Middle school – 8th grade English.

Jimmy is Mr. Sharer's most challenging 8th grade English student. Jimmy's challenges are not due to misbehavior, but rather withdrawal and little willingness to try. Jimmy has a history of school failure. The frustrating aspect for Mr. Sharer is that Jimmy appears to be a capable student.

After a conversation with Jimmy, Mr. Sharer thinks that Jimmy pictures himself as a bad writer and weak reader. Currently the class is learning how to write opinion pieces with references to research that supports their ideas. Since Jimmy is interested in motocross, Mr. Sharer brought in a teen-magazine on the topic. He asked Jimmy to choose one article to read. Not surprisingly, Jimmy chose a very short, half page description about different tires for the bikes. With no judgment expressed about the length of the article, Mr. Sharer asked, "Which tires would you purchase? Why?" As Jimmy answered the questions, Mr. Sharer scripted what he said.

Then, he handed the script to Jimmy and asked him to simply rewrite what was on the paper and change anything he thought Mr. Sharer miswrote, or add anything he wanted. Jimmy returned to Mr. Sharer in about ten minutes. "I just changed some words to better motocross terms." Mr. Sharer responded, "Great, now use the computer to find another article about motocross tires." Mr. Sharer specifically did not say anything more about writing; that would come after Jimmy successfully followed the directions to find an article. Mr. Sharer was already thinking ahead that he would take time to discuss any article Jimmy located. His goal was to help Jimmy decide whether it was a valid source for information about the motocross tires, or if it would be of more value to search for another. He wants Jimmy to experience little episodes of success and hopefully get incrementally increased effort from him.

High school – physical education.

High school physical education class can be a minefield of adolescent emotions that interfere with motivation and effort. For this reason Mr. Zimmerman often chooses to use activity stations in his classes. He has found he can limit the group size at each station, group students together that will be supportive of each other, design and adjust the station activities to student needs, and add elements of fun to the activities while also targeting a skill.

For example, during a badminton unit, one station has pairs of students using a marshmallow as the birdie. The goal is to get the marshmallow in the partner's mouth. One partner practices using the badminton racket to serve the birdie, while the other practices watching the birdie in an attempt to get the marshmallow to land in his/her mouth. The focus is still on skill development (eye to hand coordination), but the fun diverts the typical adolescent self-consciousness. Participation is the first key to skill development. Stations give Mr. Zimmerman more flexibility in managing his high school students' willingness to participate.

Theme 18: Performance Feedback

Elementary – language arts.

Early in the school year, Mrs. Edwards uses a short play, with several characters to get her students to practice reading with expression. Reading with expression is difficult for most children, particularly in front of peers. So, Mrs. Edwards recruited some fellow colleagues to read various parts for her to record. The purpose was to demonstrate reading with expression. After the students read a play silently, she plays the teachers' recording of the play for her students. The class discusses the various expressions of the different characters, the voices used, and the cadence of the actors' readings. This provides an excellent model for the students.

Then, she has her students developed a list of 'reading with expression' techniques that made the play fun to hear and helped make the characters come alive. They also discuss that one job of a director is to give feedback to actors in order to help them perform better. Next, the students practice parts of the play in small groups and coach each other about how to apply the reading with expression techniques they identified. Mrs. Edwards uses the same activities with different plays. She has found that these lessons help establish an understanding and purpose for performance feedback.

Middle school – art.

Commenting on middle school student artwork is a delicate process. First, the work is very personal. Also, Mr. Mueller prefers not to write on the artwork itself. Mr. Mueller gives ongoing feedback while his students are working during class.

Yet, he cannot be everywhere at one time, and felt he was not providing timely feedback to all his students.

To solve both issues, he decided he would review student work throughout the day and write his feedback on sticky notes that he could attach to the work. When possible, he would place the note right at the art element spot that related to the comment. He found he could write feedback using this process during short time segments anytime during the day. When the students arrived for the next art class, they read the notes about what they did well, what they might change, or what they could improve; then they would get right to work. He found some would ask him to elaborated more on a statement, or demonstrate what he meant.

It became a very positive routine. It even helped to develop better peer assessment. One day he placed student watercolor paintings on the walls around the art room. With sticky notes in hand, the students left feedback on their classmates' work based on the principles of watercolor and other art elements they had learned. It worked wonderfully as a learning tool for both the feedback giver and receiver.

High school – technology.

In his high school computer class, Mr. Santos' students were applying the skills they learned about using a software graphing program to produce graphs from data they were given. At the start of the class, he gave each student a printout exemplar of two well-designed graphs using the computer program. On it were feedback statements that identified the specific elements that were done well. At the end of class, he asked the students to print out their graphs, at whatever point of completion they had reached. They were instructed to use the exemplar and make comments on their own graphs about what they thought they had done well, what they may need to improve, or change. They also could write questions or problems he did not get a chance to address during the class. In addition, they had to state what their next step will be when they return to class the next day.

At the conclusion of the next class, he instructed the students to do the same thing. When each student completed the assignment, they had to turn in their daily evaluations with their final product. This activity gave Mr. Santos the opportunity to not only give feedback on his students' final product, but also to comment on the thinking process they used to judge their own work progression toward completion of the final product.

Theme 19: Stagecraft

Elementary – language arts.

Mrs. Eden was digging in her classroom closet one day and found a set of old flannel board figures that coordinated with several classic picture books. She had not seen a flannel board in years, but she decided to use the pieces as she read one of the stories to her students. She made a flannel board to place on a chart holder, and the next day read *May I Bring a Friend?* by Beatrice Schenk de Regniers and illustrated by Beni Montresor. She used the story to practice rhyming words and to talk with the students about manners. The children loved the scenes she made using the flannel pieces while she read the story. During center time a few students asked if they could play with flannel pieces and board. Soon she spotted them recreating the scenes and retelling the story. They were practicing retelling and rhyming! Flannel board stories became a new teaching tool for Mrs. Eden.

Middle school – art.

Mr. Gatenbergs's middle school art students learned about many visual arts styles, such as Art Nouveau, Art Deco, Cubism, and the Aztecs. For a review activity, he placed various sized art replications of different styles around the room. The students had to study each piece and categorize it by style. He told the students they were museum curators and were analyzing artwork for their museums. Then, he darkened the room and turned on lights to highlight each art piece. This made the room feel more like a museum than a classroom.

High school – physics.

Mr. Mason's physics class was one of the students' favorites. In addition to many hands-on lab activities and interesting teacher demonstrations in his class, Mr. Mason just seemed to know how to make physics fun. For example, he knew that some lecture time was necessary, and there were times he simply had to share and review information with his students. So he called these class times the *Einstein Brain Gain Times*. He explained to his students that since Einstein and others had already discovered a lot about physics, it was valuable to save time and just learn from their troves of knowledge. To emphasize this point, each time a class activity resembled a lecture, Mr. Mason put on a lab coat and an Einstein wig. The students would always comically moan and groan about the costume and the lecture time. Yet

Mr. Mason knew that the costume was an expected component that made the lecture time more appealing.

Theme 20: Complementary Elements

Elementary – 2^{nd} grade language arts.

One spelling activity Mrs. Jackson's second grade class enjoys is *Big to Little* spelling. This activity has the students start by standing and writing the spelling word in the air. Then, they write the word on their desks using their fingers. Next, they do the same on the palm of their hands. Finally, they pick up their pencils and write the word on paper. The routine continues for each word.

Middle school – science.

Students in Mrs. Takano's class always enjoy the science activity where they identify unknown minerals by using different mineral properties to test each and gather clues. To reinforce their learning Mrs. Takano switches the activity around. She gathers up all the minerals and places them in a bag. Then she chooses one mineral from the bag and does not allow the students to see it. She gives clues about the mineral and the students have to use the clues to figure out which mineral she chose.

High school – merchandising.

When Ms. Cameron teaches the unit on the historical development of the fashion industry, she always combines her lecture sessions with student activities where the students can use their creativity. This helps combine their understanding of the details of the fashion with the larger concept of style.

She has the students make a digital collage of fashions depicting an era, or find pictures of famous people of the era wearing classic examples of the styles. Her favorite is when they study the sixties to mid-seventies. She instructs the students to gather clothing from home and elsewhere to create an outfit that represents the era. The students always have a lot of fun modeling their Disco and Flower-Power outfits.

Theme 21: Time and Timing

Elementary – 4th grade math.

Mrs. McLean finished a 4th grade math lesson on long division. She was very pleased with the focus and effort her students gave to the activities throughout the lesson. Long division was a hard concept for her students, and they obviously were brain weary from the determination and persistence they had applied. A social studies lesson on state history was next on the class schedule. She had planned a small group activity for her students. The students would work together using a graphic organizer to research information about historical people from the state. She originally figured this activity would be a change from the mostly individual work during the previous math lesson.

She decided, however, that the students might not put forth the effort they would need to do the research since they appeared so mentally drained. Therefore, she quickly made a change in plans and decided to teach the following day's social studies lesson instead. For this lesson, she had an interesting movie that shared historical state monuments, homes, and other locations. Most of the points of interest were related to the historical people the students would research. During the movie the students would use a note sheet to record information. This lesson was definitely less intensive. She could easily switch the lessons, and tomorrow transfer the information from the movie to the research activity.

Middle school – 7th grade.

Miss Bide's 7th graders were not good at pacing their efforts with the given time allotments. She knew her students were familiar with the lyrics of many songs, and they had a sense of how long a song lasted. So, she found that she could play an appropriate popular song softly in the background as her students worked and use the song to pace their efforts. She would state, "You should be done with the first activity by the end of this song" or "You have until the middle of this song to get your materials ready." The students' understanding of the song parts and lengths gave them a more concrete way to pace themselves.

High school – health and wellness.

Brent Minchin taught high school health and wellness. High school students generally have a good understanding of the human reproductive system and the reproductive process. Yet, this unit could still cause uneasiness and unsuitable classroom behavior. Knowing this, Mr. Minchin always planned for this unit to occur about three-quarters of the way into the semester. That way he had time to create a positive classroom atmosphere. He took time to get know his students and used learning activities to help the students feel safe, respected, and emotionally comfortable in his class before teaching this unit. This process provided him with more student behavior controls during the unit lessons.

Theme 22: Personal Presence

Elementary school.

Ms. Fuser had several stuffed teddy bears on a self in the classroom. The bears were used for one purpose. When a student was absent, his or her assigned classroom buddy would choose one of the bears to sit in the absent child's seat. The bears were visual reminders to collect classwork and materials for the absent child. The buddies also had to bring the bears to different class activities throughout the day such as music class, lunch, or recess.

The purpose was to remind everyone that a classmate was absent, and a part of the class family was missing. It was common to hear a student say something similar to, "Hey, Ruby you forgot to get Billy!" when the class was about to leave the room. Ms. Fuser discovered that this system benefitted the classmates present, and the absent child. After an absence, children would always ask, "Which bear was I?" They knew their absence was recognized and they were in the thoughts of everyone while they were gone.

Middle school – 6th grade.

Mrs. Cummings recognized that her sixth grade students displayed periods of disrespect, unwillingness to try, poor sportsmanship, or other traits that sometimes seemed to spread like germs. At times, the attitudes interfered with the whole class atmosphere. This is when she would call to order a class meeting. She would objectively share her concerns, without using specifics or names, and ask the students for their thoughts about changes to make. This seemed to help everyone clarify issues and energize positive actions. Following one class meeting a student said, "Mrs. Cummings, I like it when you share class problems and ask for our ideas. It makes me feel like you think we are important." This was a reminder to her that what she does, not just what she says, makes the most impact on her students.

High school – masonry.

Mr. Fry was demonstrating to his Masonry I class how to lay bricks to build a level wall. He demonstrated how to measure the length according to a plan, how to start laying the bricks from each end, and how to use the level. As he demonstrated, it seemed to the students like he was an artist creating a masterpiece. As they watched him create, he suddenly stopped and said, "Oh wait, you guys are supposed to do this. Get to your stations and get to work." One student then commented that she enjoyed watching him work. "It's like you talk to the bricks as you work. Watching you work makes me want to do the same thing."

Theme 23: Delight

Elementary – 1st grade language arts. Ms. Levin had a creative way for her first grade students to practice their sight words. She made labels of the words to practice and placed them on strips of medium size bubble wrap. At a learning center, there were several packets of the bubble wrap words. A pair of children would scatter one packet on the floor. Then, taking turns, one would read the word on an index card and the other had to find the word and "stomp" on it. It was one of the students' favorite centers.

Middle school – 6th grade science. When Mrs. Casters' 6th grade science students walked into the classroom, the song, "Don't Touch That" was playing. Also there was a large covered container of a green substance on a table at the front of the room. A sign near it stated: *Don't touch this!* Of course Mrs. Casters received many questions about the container as the students arrived. She simply responded that they would find out about it later in the class.

Then, after a class review of the states of matter, she opened the lid and punched down at the substance. A "*SMACK*" sound was made. She asked the class if it was a solid, liquid or gas in the container. They all called out, "A solid." Then, she had one student come up to feel the substance to verify that it was a solid. When the child put his hand in the container it easily moved down through the substance and he called out, "No way!" The class was confused. She then gave each student a small, clear, plastic glass of the substance so they all could explore its qualities. It was a mixture of water and cornstarch. This mixture has a different thickness depending on the force applied. Next, Mrs. Casters introduced the terms Newtonian and non-Newtonian fluids, and went on to teach about substances that do not fall neatly into the solid, liquid, or gas categories.

High school - administration. One day during the long academic stretch between January and April, all the teachers at Mr. Cebone's high school entered their classrooms and found a decorated plastic cup on their desks. Attached to it was a note that read: *You highlight our school.* In it were three highlighters. It was amazing how a little surprise could energize the mood of the faculty.

Appendix II: Additional Research and Resources

Theme 1: Clear Learning Goals

Clare, L., Lindon, D. E., Phil, J. D., Woods, R. T., Whitaker, R. M., Evans, S. J., & Rugg, R. D. (2010). Goal-oriented cognitive rehabilitation for people with disease: A single-blind randomized controlled trial of clinical efficacy. *American Journal of Geriatric Psychiatry, 18*(10), 928-939. doi:10.1097/JGP.0b013e3181d5792a

Abstract (quoted from source):

Eight weekly individual sessions of CR [cognitive rehabilitation]consisting of personalized interventions to address individually relevant goals supported by components addressing practical aids and strategies, techniques for learning new information, practice in maintaining attention and concentration, and techniques for stress management. The primary outcomes were goal performance and satisfaction, assessed using the Canadian Occupational Performance Measure. Questionnaires assessing mood, quality of life and career strain, and a brief neuropsychological test battery were also administered. A subset of participants underwent functional magnetic resonance imaging (fMRI).CR produced significant improvement in ratings of goal performance and satisfaction, whereas scores in the other two groups did not change. Behavioral changes in the CR group were supported by fMRI data for a subset of participants. The findings support the clinical efficacy of CR in early-stage AD. CR offers a means of assisting people with early-stage AD and their families in managing the effects of the condition.

Locke, E. A., Shaw, K. N., Saari, L. M., & Latham, G. P. (1981). Goal setting and task performance: 1969-1980. *Psychological Bulletin, 90*(1), 125-152. doi:10.1037/0033-2909.90.1.125

Abstract (quoted from source):

Results from a review of laboratory and field studies on the effects of goal setting on performance show that in 90% of the studies, specific and challenging goals led to *higher performance than easy goals, "do your best" goals, or no goals. Goals affect performance by directing attention, mobilizing effort, increasing persistence, and motivating strategy development. Goal setting is most likely to improve task performance when the goals are specific and sufficiently challenging, Ss have sufficient ability (and ability differences are controlled), feedback is provided to show progress in relation to the goal, rewards such as money are given for goal attainment, the experimenter or manager is supportive, and assigned goals are accepted by the individual. No reliable individual differences have emerged in goal-setting studies, probably because the goals were typically assigned rather than self-set. Need for achievement and self-esteem may be the most promising individual difference variables.*

Page-Voth, V., & Graham, S. (1999). Effects of goal setting and strategy use on the writing performance and self-efficacy of students with writing and learning problems. *Journal of Educational Psychology, 39*(2). doi:10.1037/0022-0663.91.2.230

Abstract (quoted from source):

This study examined the effects of goal setting on the essays of 7th- and 8th-grade students with writing and learning disabilities. Participants wrote 3 essays, responding to a different goal for each. One half of the students used a strategy to facilitate goal attainment. Goals were designed to increase either the number of reasons supporting a paper's premise or the number of counterarguments refuted by the writer, or both. Papers written in response to goals were longer, included more supporting reasons, and were qualitatively better than essays written by students in the control condition. Students were also more likely to refute counterarguments when assigned a goal that focused on this specific element. Strategy use enhanced performance only when students were responding to a goal to refute more counterarguments. Students' writing self-efficacy was not influenced by goal setting or strategy use.

Simon, B., & Taylor, J. (2009). What is the value of course specific learning goals? *Journal of College Science Teaching, 39*(2), 52-57.

Abstract (quoted from source):

This study explored the impact of learning goals on the individual student in a course and, to a lesser degree, on the instructors teaching the courses. The focus was on *three courses in which instructors had detailed, course-specific learning goals that were integrated into their classes. To explore the general hypothesis that specific, course-level learning goals improved the student's interaction with the course, the study looked specifically at the following questions:*

- *Did students perceive learning goals as being valuable in the course?*
- *What did students report about how they used learning goals and how was this different across several instructors and courses?*
- *Did the instructors perceive the value of learning goals for both themselves and their students?*

The results indicate that explicit learning goals provide a valuable aid to guide students in their learning. These results give instructors a glimpse into how students use learning goals and suggest best practices for the use of learning goals.

Books

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals; Handbook I: Cognitive domain.* New York, NY: Longmans, Green.

Kryza, K., Duncan, A., & Stephens, S. J. (2010). *Differentiation for real classrooms: Making it simple, making it work.* Thousand Oaks, CA: Corwin Press.

Marzano, R. J. (2007). *The art and science of teaching a comprehensive framework for effective instruction.* Alexandria, VA: Association for Supervision and Curriculum Development.

Marzano, R. J. (2009). *Designing & teaching learning goals & objectives.* Bloomington, IN: Marzano Research Laboratory.

Moss, C. M., & Brookhart, S. M. (2009). *Advancing formative assessment in every classroom: A guide for instructional leaders.* Alexandria, VA: Association for Supervision and Curriculum Development.

Articles

Costa, A. L. (2008). The thought-filled curriculum. *Educational Leadership, 65*(5), 20-24.

Giunta, J. P. (2010). Designing games that really teach. *T + D, 64*(6), 76-77.

Jones, K. A., Vermette, P. J. & Jones, J. L. (2009). An integration of "backwards planning" unit design with the two-step lesson planning framework. *Education, 130*(2), 357-360.

Kelly, L. P. (1980). The role of learning objectives under the academic big top. *Journal of Developmental & Remedial Education, 4*(1), 22-23.

Krathwohl, D. (2002). A revision of bloom's taxonomy: An overview. *Theory into Practice, 41*(4), 212-18. doi:10.1207/s15430421tip4104_2

Phelps, M. (2010). Real-time teaching and learning. *Kappa Delta Pi Record, 46*(3), 132-35. doi:10.1080/00228958.2010.10516711

Pitts, G. S. (1987). Breathe O_2 into your mathematics program - Promote openness and ownership. *Teaching Children Mathematics, 3*(9), 496-98.

Theme 2: Congruency

Der-Thanq, C., Hung, D., & Wang, Y. (2007). Educational design as a quest for congruence: The need for alternative learning design tools. *British Journal of Educational Technology, 38*(5), 876-884. doi:10.1111/j.1467-8535.2006.00675.x

Abstract (quoted from source):

There is a common predicament faced by educational designers, that is, the lack of learning design tools for nontraditional pedagogies of learning. Because of this lack of alternatives, educational designers often use traditional design tools in contexts where nontraditional learning activities (such as collaborative projects) are desired. Because the learning goals of objectivist and alternative epistemologies differ, the designed instructional/learning activities do not match the original goals or desired learning outcomes. It is argued that learning design should be understood of as a quest for congruence between learning epistemologies and designs. This paper proposes an analytical framework to help identify the congruence or lack thereof of a learning design. The framework consists of: (1) the employed epistemology and desired learning outcome, (2) focus of analysis, (3) focus of design and (4) the design process. It is hoped that this framework will provide a lever for developing design tools that are more congruent with alternative pedagogies.

Rich, H. L., & Bush, A. J. (1978). The effect of congruent teacher-student characteristics on instructional outcomes. *American Education Research Journal, 15*(3), 451-457. doi:10.3102/00028312015003451

Abstract (quoted from source):

Twenty fourth, fifth and sixth grade teachers with direct and indirect teaching styles were paired with a small group of students who were high or low on social-emotional development to create congruent and incongruent matches. Teachers used their natural style in teaching a series of reading lessons for 20 consecutive school days. Congruency was consistently related to instructional outcome with the effect strongest for student affect, followed by achievement, followed by time at attention to task. It is argued that these findings support Hunt's theory of person-environment congruency for effective teaching.

Thomas, A. K., & McDaniel, M. A. (2007). The negative cascade of incongruent generative study-test processing in memory and metacomprehension. *Memory and Cognition, 35*(4), 668-678.

Abstract (quoted from source):

Previous research suggests that when participants engage in generative study activities, the processing of text is enhanced and improvements in memory and

metacomprehension result. However, few studies have investigated the influence of processes required by the testing situation or the interaction between encoding and retrieval processes on metacomprehension accuracy. The present experiments examine whether the congruency of processes generated during study and required at retrieval affect memory, metacomprehension, and control processes. Study orientation and test type were congruent (i.e., letter-reinsertion: detailed test), incongruent (i.e., letter-reinsertion: conceptual test), or neutral (i.e., read: conceptual test). After generative study, but before testing, participants made metacomprehension predictions for previously studied texts. Controlled strategy selection was measured in Experiment 2. When processes at study and test were congruent, cued recall performance and metacomprehension predictions were more accurate than when study and test were incongruent. For incongruent conditions, metacomprehension predictions were no better than chance; thus, controlled strategy selection was based on inaccurate metacomprehension, thereby further penalizing memory performance relative to congruent conditions. These findings extend a transfer-appropriate processing framework to metacomprehension.

Wetzel, D. K., & Buch, K. (2000). Using a structural model to diagnose organizations and develop congruent interventions. *Organization Development Journal, 18*(4), 9-20.

Abstract (quoted from source):

The purpose of this paper is to describe a change process based on a structural model of differentiation and integration. The process consists of five steps that can be conducted by internal or external change agents and directed at the micro or macro levels. It is designed to focus the diagnostic and intervention phases of organizational development on structural elements of the organization and the sometimes-overlooked impact of interventions on differentiation and integration. We have used the process to help organizational members develop a mental model of structure, to identify recent trends moving organizations toward reduced levels of differentiation and increased levels of integration, and to reveal internal structural gaps. A structural gap analysis reveals interventions that are most congruent with the organization's needs. It is important that the client select the type of intervention best matched to its needs. It is also important that separate initiatives are congruent with one another. The process helps clients become discriminating consumers of the many interventions available today. We have found the process to provide a powerful introduction to organizational structure and its implications.

Books

Baines, L., & Kunkel, A. J. (2010). *Going bohemian: How to teach writing like you mean it.* Newark, DE: International Reading Association.

Hunter, M. C. (1994). *Enhancing teaching.* New York, NY: Macmillan College Publishing.

Tucker, N. D., & Stronge, J. H. (2005). *Linking teacher evaluation and student learning.* Alexandria, VA: Association for Supervision and Curriculum Development.

Articles

Ball, A. L., & Washburn, S. G. (2001) Teaching students to think: Practical applications of Bloom's Taxonomy. *The Agricultural Education Magazine, 74*(3), 16-17.

Drum, R. L., & Petty, W. G. (1999). Teaching the values of coins. *Teaching Children Mathematics, 5*(5), 264-68.

Kitchen, R. S., & Wilson, L. D. (2004). Lessons learned from students about assessment and instruction. *Teaching Children Mathematics, 10*(8), 394-399.

Trader, M. C. (1980). A checklist for teaching to an objective. *Educational Technology, 20,* 36-40.

Theme 3: Task Analysis

Browder, D. M., Trela, K., & Jimenez, B. (2007). Training teachers to follow a task analysis to engage middle school students with moderate and severe developmental disabilities in grade-appropriate literature. *Focus on Autism* *and Other Developmental Disabilities, 22*(4), 206-214. doi:10.1177/10883576070220040301

Abstract (quoted from source):

The purpose of this study was to train teachers to follow a task analysis to teach a story-based literacy lesson using adapted, grade-appropriate middle school literature to students with moderate and severe developmental disabilities. A multiple-probe-across-participants design was used to examine the effects of training teachers to follow a literacy lesson plan task analysis on the number of steps completed by teachers on the literacy lesson plan template and changes made by students in response to teachers' use of the literacy lesson plan. Results indicated a functional relationship between teacher training and the number of lesson plan steps followed, with a corresponding student increase in both overall and independent correct responses. Implications for practice and future research are discussed.

Fastenmeier, W., & Gstalter, H. (2007). Driving task analysis as a tool in traffic safety research and practice. *Safety Science, 45*(9), 952-979.

Abstract (quoted from source):

The paper explains the need for task analysis in the context of car driving, because the interaction between the car drivers' capabilities and the demands of the actual driving task determines the outcome in terms of a more or less safe driving behavior. After reviewing past approaches, the main focus is on the presentation of a new procedure for driving task analysis and driver requirement assessment. A framework for task analysis is derived both from classifications of road traffic situations and a model of the drivers' information processing. The first step of the procedure is to divide a given driving task into subtasks. These subtasks are appointed to defined stretches of the road and the time structure of the subtasks is determined. For each subtask an analysis format is used, that organizes different requirements into perception, expectation, judgment, memory, decision and driver action. Then, typical driver errors are attached to the subtasks, and all the information together is compressed to ratings of complexity and risk in order to derive the crucial subtasks. Finally, some examples of how the method can be applied are presented and its future usefulness is discussed.

Grote, I., Rosales, J., & Baer, D. M. (1996). A task analysis of the shift from teacher instructions to self-instructions in performing an in-common task. *Journal of Experimental Child Psychology, 63*(2), 339-357. doi:10.1006/jecp.1996.0053

Abstract (quoted from source):

Three preschool children repeatedly did four kinds of sorts with a deck of stimulus cards: a difficult, untaught target sort and three other sorts considered analytic of self-instructing the target performance. The untaught target sort was to find in a deck of cards those matching what two sample cards had in common. Most preschool children must be taught to mediate this problem. The three other kinds of sorts taught skills involved in the target performance or its mediation. As correct self-instructive talk emerged in the target sorts, it was confirmed. The untaught target sorts were interspersed infrequently among the three alternating directly taught skill sorts, to see if accurate target sorts, and accurate self-instructive talk about the target sorts, would emerge as the three skill sorts were mastered. As all the sorts progressed, increasing accuracy was seen first in the skill sorts and then in the untaught target sorts. All three subjects showed subsequent generalization to new target sorts involving other stimulus sets. Correct spontaneous self-instructions about the target sorts increased from near zero at the beginning of the experiment to consistency at its end. Thus, the three skill sorts appeared sufficient for the emergence of a self-instructed solution to the previously insoluble target performance.

Sherman, T. M., & Wildman, T. M. (1980, April). *Linking task analysis with student learning.* Paper presented at the Annual Convention of the Association for Educational Communications and Technology, Denver, CO. Retrieved from ERIC database. (ED195229).

Abstract (quoted from source):

An examination of task analysis from several perspectives in order to identify some of its purposes and advantages reveals that, as the interest in learning theory has shifted from a predominately behavioral perspective to a more cognitive orientation, the purpose of task analysis has also shifted. Formerly the purpose of task analysis was to aid in instructional design by identifying and classifying component behaviors which could accumulate into a terminal performance. However, cognitive and information processing theorists have not been so interested in the component behaviors as in the cognitive activity that occurs between these behaviors. Thus the

emphasis on task analysis has shifted from behavioral outcomes to the analysis of cognitive processes. Three cognitive approaches to task analysis are (1) the optimal content structure approach, (2) the learner-content match approach, and (3) the optimal content presentation approach. Although task analysis has been approached from several perspectives, there is agreement among all the theorists on at least one point: Task analysis, at a minimum, assists the instructor or designer to understand the content to be taught. This alone is a sufficient reason for recommending task analysis.

Books

Crandall, B., Klein, G. A. & Hoffman, R. R. (2006). *Working minds: A practitioner's guide to cognitive task analysis*. Cambridge, MA: Massachusetts Institute of Technology.

Downey, C. J. (2009). *50 Ways to close the achievement gap.* Thousand Oaks, CA: Corwin Press.

Ellis, R. (2010). *Task-based language learning and teaching*. New York, NY: Oxford University Press.

Hunter, M. C. (1994). *Enhancing teaching*. New York, NY: Macmillan College Publishing.

Jonassen, D. H., Tessmer, M. & Hannum, W. H. (1999). *Task analysis methods for instructional design.* Mahwah, NJ: L. Erlbaum Associates.

Schraagen, J. M., Chipman, S. F. & Shalin, V. L. (2000). *Cognitive task analysis.* Mahwah, NJ: L. Erlbaum Associates.

Articles

Carter, M. & Kemp, C. (1996). Strategies for task analysis in special education. *Educational Psychology, 16*(2), 155-70. doi:10.1080/0144341960160205

Militello, L. G. & Hutton, R. J. B. (1998). Applied cognitive task analysis (ACTA): A practitioner's toolkit for understanding cognitive task demands. *Ergonomics, 41*(11), 1618-1641.

Newhall, P. W. (2010, February 8). Teaching time management to students with learning disabilities. *LD OnLine*, Retrieved from http://www.ldonline.org/article/Teaching_Time_Management_to_Students_with_Learning_Disabilities

Olsen, J. K. (2009). Being deliberate about concept development: Effectively moving students from experience to understanding. *Science and Children, 46*(6), 51-55.

Theme 4: Diagnosis

Chu, H., Hwang, G., & Huang, Y. (2010). An enhanced learning diagnosis model based on concept-effect relationships with multiple knowledge levels. *Innovations in Education and Teaching International, 47*(1), 53-67. doi:10.1080/14703290903525846

Abstract (quoted from source):

Conventional testing systems usually give students a score as their test result, but do not show them how to improve their learning performance. Researchers have indicated that students would benefit more if individual learning guidance could be provided. However, most of the existing learning diagnosis models ignore the fact that one concept might contain multiple knowledge levels with different degrees of difficulty, and hence students might be guided in an inefficient and ineffective way. In order to provide more precise learning guidance to individual students, the study described in this paper uses an enhanced concept-effect model for diagnosing students' learning problems and providing learning advice. The experimental results from a mathematics course have demonstrated the utility and effectiveness of this innovative approach.

Hailikari, T., Katajavuori, N., & Lindblom-Ylanne, S. (2008). The relevance of prior knowledge in learning and instructional design. *American Journal of Pharmaceutical Education, 72*(5), 113-116. doi:10.5688/aj7205113

Abstract (quoted from source):

This research was designed to determine how different types of prior knowledge (declarative and procedural) impact student achievement and how prior-knowledge assessment can be used as an instructional design tool. A questionnaire was developed based on the prior-knowledge model, which distinguishes between declarative and procedural knowledge. One hundred fifteen pharmacy students were tested prior to beginning 4 successive basic science courses and then prior to beginning a pharmaceutical chemistry course. Regression analysis was used to determine which type of knowledge was the best predictor of student achievement. The four course instructors were interviewed and their comments analyzed. Results showed that prior knowledge from previous courses significantly influenced student achievement. Procedural knowledge was especially related to student achievement. Instructors and students had mainly positive reactions towards the prior-knowledge tests. Students' prior knowledge should be taken into consideration in instructional design and curriculum planning. Furthermore, the results of prior-knowledge assessments may be used as a tool for student support in addressing areas of deficiency.

Oberg, C. (2010). Guiding classroom instruction through performance assessment. *Online Journal of Case Studies in Accreditation and Assessment, 1, 1-11.* Retrieved from: http://www.aabri.com/manuscripts/09257.pdf

Abstract (quoted from source):

Current research indicates that students need authentic, meaningful curriculum to remain involved with the learning process, that this type of learning has positive results on high stakes exams, and that teachers require prior knowledge of students' skills and interests to develop high quality and effective instruction and curriculum. To "front load" the curriculum with authentic performance (pre)assessments offers the teacher as well as the student a way of examining current skills and knowledge prior to instructional decision making, and presents a direct link to authentic instruction. How best to do this within the confines of a school district is a significant dilemma. This paper will provide evidence and examples of the use of performance assessments as alternatives to traditional paper-pencil tests to be used as pre-

assessment measures to assist teachers in learning as much as possible about their students as they create lessons prior to instruction. Teachers can use performance assessment to obtain a rich and complete picture of what students know and are able to do (Elliott, 1995). With these data, teachers can enhance the quality of their lessons by create appropriate and engaging lessons, and involve students within the entire learning assessment process.

Wu, Y. (2010). Applying learning diagnosis diagram in computer aided instructions: Research, practice and evaluation. *International Journal of Distance Education Technologies, 8*(2), 28-42. doi:10.4018/jdet.2010040103

Abstract (quoted from source):

In Taiwan, when students learn in experiment-related courses, they are often grouped into several teams. The familiar method of grouping learning is "Cooperative Learning". A well-organized grouping strategy improves cooperative learning and increases the number of activities. This study proposes a novel pedagogical method by adopting the Learning Diagnosis Diagram to obtain students' knowledge structure. According to each knowledge structure of the student, this study proposes dynamic grouping to solve problems in the conventional once-and-for-all grouping strategy. The dynamic grouping method achieves the best complementary groups for further learning stages. Two courses were applied to conduct the proposed Two-phase Cooperative Learning. Complementary grouping methods and more interaction among team members are helpful for increasing the effect of learning. Evaluation results indicate that the proposed method significantly improves the learning achievement of all learners.

Zydney, J. M., Deihl, L., Grincewicz, A., Jones, P., & Hasselbring, T. S. (2010). Empowering learners to choose the difficulty level of problems based on their learning needs. *Journal of Systemics, Cybernetics and Informatics, 8*(4), 8-13.

Abstract (quoted from source):

Research has found that increasing learner control offers several benefits, including increased motivation, attitude, and learning. The goal of the present study was to determine how prior math achievement influences students' selection of the difficulty level of problems within Math Pursuits, a hypermedia learning program. Math Pursuits was designed to help children understand mathematics by discovering how it relates to the world around them. The program presented each learner with an

adjustable level of challenge, along with the necessary scaffolding to support success. The researchers hypothesized that students with lower math skills would choose to start with a lower difficultly level; whereas, students with higher math skills would begin the program by choosing a question with a higher level of difficulty. Results supported these hypotheses. This research also examined the motivational framework guiding students' selection of problem difficulty.

Books

Downey, C. J. (2009). *50 Ways to close the achievement gap.* Thousand Oaks, CA: Corwin Press.

Ellis, A. K. (2001). *Teaching, learning, and assessment together: The reflective classroom.* Larchmont, NY: Eye on Education.

Kozulin, A., Gindis, B., Ageyev, V. S., & Miller, S. M. (Eds.). (2003) *Vygotsky's educational theory in cultural context.* Cambridge, UK: Cambridge University Press.

Tuttle, H. G (2009). *Formative assessment responding to your students.* Larchmont, NY: Eye on Education.

Articles

Ash, D., & Levitt, K. (2003). Working within the zone of proximal development. *Journal of Science Teacher Education, 4*(1), 1-313.

Buchanan, E. A. (1999). Assessment measures: Pre-tests for successful distance teaching and learning? *Online Journal of Distance Learning Administration, 2*(4). Retrieved from http://www.westga.edu/~distance/ojdla/winter24/buchanan24.html<http://www.westga.edu/~distance/buchanan24.html

Bunce, G. (2003). *Educational implications of Vygotsky's zone of proximal development on collaborative work in the classroom.* Retrieved from http://www.guybunce.co.uk/writings/academic/vygotsky-and-the-classroom.pdf

Theobold, J. T., & Alexander, J. E. (1977). An auditory cloze procedure for assessing the difficulty level of teacher instructional talk in the intermediate grades. *Elementary School Journal, 77*(5), 388-394.

Tomlinson, C. A. (2007). Learning to love assessment. *Educational Leadership, 65*(4), 8-13.

Theme 5: Overt Responses

Barch, D. M., Sabbb, F. W., Carter, C. S., Braver, T. S., Noll, D. C., & Cohen, J. D. (1999). Overt verbal responding during fMRI scanning: Empirical investigations of problems and potential solutions. *NeuroImage, 10*(6), 642-657. doi:10.1006/nimg.1999.0500

Abstract (quoted from source):

This paper presents a pair of studies designed to empirically explore the severity of potential artifacts associated with overt verbal responding during fMRI scanning and to examine several different solutions to these artifacts. In Study One, we compared susceptibility artifacts, signal-to-noise ratios, and activation patterns when overt versus covert verbal responses were elicited during fMRI scanning, using both individual and group analyses. The results indicated that different patterns of brain activation were elicited during covert as compared to overt verbal responses. This suggests that covert responses cannot be used as a simple substitute for overt verbal responses. Further, the results suggested that the use of overt verbal responses during fMRI scanning can produce interpretable results if: (1) the primary comparison is between two conditions that both use overt verbal responses, and (2) analyses are conducted on pooled group data rather than individual participant data. In Study Two, we evaluated the feasibility and validity of a method for acquiring participants' *overt responses during fMRI scanning. The results indicated that our method was very accurate in acquiring the content of participant's responses. Further, inspection of the responses demonstrated that participants do not always comply with task instructions and highlighted the importance of obtaining behavioral performance measures during fMRI scanning.*

Knapp, F. A., & Desrochers, M. N. (2009). An experimental evaluation of the instructional effectiveness of a student response system: A comparison with constructed overt responding. *International Journal of Teaching and Learning in Higher Education*, *21*(1), 36-46.

Abstract (quoted from source):

Student response systems (SRSs) are increasingly being used in the classroom. However, there have been few well-controlled experimental evaluations to determine whether students benefit academically from these instructional tools. Additionally, comparisons of SRS with other interactive methods have not often been conducted. We compared SRS, Constructed Overt Response (COR), passive, and control conditions to determine their effects on learning and affect. We found that students performed better in the interactive conditions—SRS and COR—than the other conditions. Participants' gain and retention of gain scores in the SRS condition were lower than those in the COR condition. Participants in the SRS condition perceived their condition as more enjoyable than those in the passive condition and more useful than those in the control condition. Additional research questions are raised about how these interactive methods may best improve student learning.

Miller, M., & Malott, R. W. (1997). The importance of overt responding in programmed instruction even with added incentives for learning. *Journal of Behavioral Education*, 7(4), 497-503. doi:10.1023/A:1022811503326

Abstract (quoted from source):

Among the fundamental tenets of programmed instruction is the requirement of overt responding. Past research has not determined when this tenet holds true. We systematically replicated the work of Tudor (1995) by showing that overt responding in computer-based instruction improves learning, even when there is an incentive that might be thought to improve learning enough to mask the effect of overt responding. Subjects were exposed to both read-only and overt-response materials. One group *received course-related, bonus points based on posttest performance, whereas the other group received points simply for participation. Within-subject comparison showed greater performance increases when overt responding was required, regardless of the point incentive.*

Salemi, M. K. (2009). Clickenomics: Using a classroom response system to increase student engagement in a large-enrollment, principles of economics course. *Journal of Economic Education, 40*(4), 385-404.

Abstract (quoted from source):

One of the most important challenges facing college instructors of Economics is helping students engage. Engagement is particularly important in the large enrollment Principles of Economics course where it can help students achieve a long-lived understanding of how economists use basic economic ideas to look at the world. In this paper, I report on how instructors can use Classroom Response Systems (clickers) to promote engagement in the Principles course. I draw heavily on my own experience in teaching a one semester Principles course at the University of North Carolina at Chapel Hill but also report on how others have used clickers to promote engagement. I conclude with evidence that students find clickers very beneficial and with an assessment of the costs and benefits of adopting a clicker system.

Books

Barkley, E. F. (2010). *Student engagement techniques: A handbook for college faculty*. San Francisco, CA: Jossey-Bass.

Harris, B. (2011). *Battling boredom: 99 strategies to spark student engagement.* Larchmont, NY: Eye on Education.

Hunter, R., & Hunter, M. C. (2004). *Madeline Hunter's mastery teaching: Increasing instructional effectiveness in elementary and secondary schools.* Thousand Oaks, CA: Corwin Press.

Stolovitch, H. D., & Keeps, E. J. (2005). *Telling ain't training*. Alexandria, VA: American Society for Training and Development Press.

Articles

Adams, S. (2011). Quick before it dries: Setting the pattern for active participation. Retrieved from http://www1.umn.edu/ohr/teachlearn/tutorials/active/resources/quick/index.html

Heward, W. L. (2004). Want to improve the effectiveness of your lectures? Try guided notes. *Talking About Teaching*. Retrieved from http://ucat.osu.edu/dosomethinggreat/heward.html

Koltz, M. S., & Snyder, W. R. (1982). Student problem solving during general chemistry lectures. *Journal of Chemical Education, 59*(9), 717-719. doi:10.1021/ed059p717

Sime, M., & Boyce, G. (1969). Overt responses, knowledge of results and learning. *Innovations in Education & Training International, 6*(1), 12-19. doi:10.1080/1355800690060103

Wolff, P., & Levin, J. R. (1972). The role of overt activity in children's imagery production. *Child Development, 43*(2), 537-547. doi:10.2307/1127554

Theme 6: Mid Course Corrections

Ruiz-Primo, M. A. (2011). Informal formative assessment: The role of instructional dialogues in assessing students' learning. *Studies in Educational Evaluation, 37*(1), 15-24. doi:10.1016/j.stueduc.2011.04.003

Abstract (quoted from source):

This paper focuses on an unceremonious type of formative assessment--"informal formative assessment"--in which much of what teachers and students do in the classroom can be described as potential assessments that can provide evidence about

the students' level of understanding. More specifically, the paper focuses on assessment conversations, or dialogic interactions or exchanges, which continuously happen in the classroom and that are at the center of informal formative assessment. It is argued that assessment conversations make students' thinking explicit in an unobtrusive manner, and when students' thinking is explicit, it can be examined, questioned, and shaped as an active object of constructive learning. The paper conceptualizes informal formative assessment at the center of effective instructional activities with the use of instructional dialogues as assessment conversations, a typical informal formative assessment practice. The paper then presents a discussion about the evidence on the effect of assessment conversations on student learning.

Yabuki, Y., & MacGregor, J. F. (1997). Product quality control in semibatch reactors using midcourse correction policies. *Industrial Engineering Chemical Research, 36*(4), 1268-1275. doi:10.1021/ie960536m

Abstract (quoted from source):
A practical approach to the control of final product quality in semibatch reactors is proposed. It is based on the use of readily available on-line measurements such as temperatures plus a few off-line analyses obtained from one or more samples taken from the reactor throughout the course of the batch run. These measurements are used either with a theoretically-based model or with simple empirical regression models to predict the final product properties. If the predictions fall outside of a defined no-control region, then a midcourse correction is made to bring the product quality closer to target. The approach is illustrated for the control of molecular weight and cross-link density in the simulated semibatch emulsion polymerization of styrene–butadiene rubber (SBR).

Young, V. M. & Kim, D. H. (2010). Using assessments for instructional improvement: A literature review. *Education Policy Analysis Archives, 18*(19), 1-39.

Abstract (quoted from source):
The current educational reform policy discourse takes for granted the central role of using data to improve instruction. Yet whether and how data inform instruction depends on teachers' assessment practices, the data that are relevant and useful to them, the data they typically have access to, and their content and pedagogical knowledge. Moreover, when one considers teachers' organizational contexts, it is

clear that school leadership and support for using data, capacity-building strategies, and the norms of adult learning and collaboration circumscribe opportunities to examine relevant data and to improve instructional practice in response. This literature review examines teacher as well as organizational practices and characteristics as they pertain to formative uses of assessment. We identify opportunities for important research to illuminate how and under what conditions teachers and schools as organizations can use data to inform instruction.

Books

Davis, B. G. (2009). *Tools for teaching* (2nd ed.). San Francisco, CA: Jossey-Bass.

Fisher, D., & Frey, N. (2007). *Checking for understanding: Formative assessment techniques for your classroom.* Alexandria, VA: Association for Supervision and Curriculum Development.

Popham, W. J. (2011). *Transformative assessment in action: An inside look at applying the process.* Alexandria, VA: Association for Supervision and Curriculum Development.

Reeves, D. B. (2004). *Accountability in action: A blueprint for learning organizations* (2nd ed.). Englewood, CO: Advanced Learning Press.

Stiggins, R. J., Arter, J. A., Chappuis, J., & Chappius, S. (2009). *Classroom assessment for student learning: Doing it right - using it well.* Portland, OR: Assessment Training Institute.

Articles

Adams, J. (2011, February 27). Mid-course feedback and corrections. Retrieved from http://www.montana.edu/teachlearn/Papers/TLC-mid-course-correction.pdf

Britton, T. (2011). Using formative and alternative assessments to support instruction and measure student learning. *Science Scope, 34*(5), 6-21.

Dirksen, D. J. (2011). Hitting the reset button: Using formative assessment to guide instruction. *Phi Delta Kappan, 92*(7), 26-31.

Rauschenbach, J. (1994). Checking for student understanding - Four techniques. *The Journal of Physical Education, Recreation & Dance, 65*(4), 60-63.

Wiliam, D., Lee, C., Harrison, C. & Black, P. (2004). Teachers developing assessment for learning: Impact on student achievement. *Assessment in Education: Principles, Policy & Practice, 11*(1), 49-65. doi:10.1080/0969594042000208994

Theme 7: Conscious Attention

Carrasco, M., & McElree, B. (2001). Covert attention accelerates the rate of visual information processing. *Proceedings of the National Academy of Sciences of the United States of America, 98*(9), 5363-5367. doi:10.1073/pnas.081074098

Abstract (quoted from source):

Whenever we open our eyes, we are confronted with an overwhelming amount of visual information. Covert attention allows us to select visual information at a cued location, without eye movements, and to grant such information priority in processing. Covert attention can be voluntarily allocated, to a given location according to goals, or involuntarily allocated, in a reflexive manner, to a cue that appears suddenly in the visual field. Covert attention improves discriminability in a wide variety of visual tasks. An important unresolved issue is whether covert attention can also speed the rate at which information is processed. To address this issue, it is necessary to obtain conjoint measures of the effects of covert attention on discriminability and rate of information processing. We used the response-signal speed-accuracy tradeoff (SAT) procedure to derive measures of how cueing a target location affects speed and accuracy in a visual search task. Here, we show that covert attention not only improves discriminability but also accelerates the rate of information processing.

Dye, M. W. G., Green, C. S., & Bavelier, D. (2009). The development of attention skills in action video game players. *Neuropsychologia, 47*(8-9), 1780-1789. doi:10.1016/j.neuropsychologia.2009.02.002

Abstract (quoted from source):

Previous research suggests that action video game play improves attentional resources, allowing gamers to better allocate their attention across both space and time. In order to further characterize the plastic changes resulting from playing these video games, we administered the Attentional Network Test (ANT) to action game players and non-playing controls aged between 7 and 22 years. By employing a mixture of cues and flankers, the ANT provides measures of how well attention is allocated to targets as a function of alerting and orienting cues, and to what extent observers are able to filter out the influence of task irrelevant information flanking those targets. The data suggest that action video game players of all ages have enhanced attentional skills that allow them to make faster correct responses to targets, and leaves additional processing resources that spill over to process distractors flanking the targets.

Maljkovic, V., & Martini, P. (2005). Short-term memory for scenes with affective content. *Journal of Vision, 5*(3), 215-229. doi:10.1167/5.3.6

Abstract (quoted from source):

The emotional content of visual images can be parameterized along two dimensions: valence (pleasantness) and arousal (intensity of emotion). In this study, we ask how these distinct emotional dimensions affect the short-term memory of human observers viewing a rapid stream of images and trying to remember their content. We show that valence and arousal modulate short-term memory as independent factors. Arousal influences dramatically the average speed of data accumulation in memory: Higher arousal results in faster accumulation. Valence has a more interesting effect: While a picture is being viewed, information from positive and neutral scenes accumulates in memory at a constant rate, whereas information from negative scenes is encoded slowly at first, then increasingly faster. We provide evidence showing that neither differences in low-level image properties nor differences in the ability to apprehend the meaning of images at short exposures can account for the observed results, and propose that the effects are specific to the short-term memory mechanism. We interpret this pattern of results to mean that information accumulation in short-term memory is a controlled process, whose gain is modulated by valence and arousal acting as endogenous attentional cues.

Maringelli, F., & Umilta, C. (1998). The control of the attentional focus. *European Journal of Cognitive Psychology, 10*(3), 225-246.

Abstract (quoted from source):

We conducted three experiments to examine the characteristics of focal attention. Experiments 1A, 1B and 1C confirmed previous results showing an inverse relation between size of the attentional focus and efficiency of processing. However, we also found attentional benefits with a comparatively short stimulus onset asynchrony. In addition, our results suggested that focusing attention is an exogenously driven reaction: Given a proper stimulus, the attentional system automatically produces a focusing response. Experiments 2 and 3 suggested that the appearance of new objects is a critical factor to capture attention. When the size of the cue that was used for focusing attention was kept constant across trials, attentional benefits disappeared. These results were interpreted as supporting the hypothesis that attentional capture is contingent on an attentional control setting.

Books

Cornish, K., Wilding, J., & Grant, C. (2006). Deconstructing working memory in developmental disorders of attention. In S. J. Pickering (Ed.), *Working memory and education* (pp. 157-188). London, UK: Academic Press.

Cowan, N. (1997). *Attention and memory an integrated framework.* New York, NY: Oxford University Press.

Gagne, E. D., Yekovich, C. W., & Yekovich, F. R. (1997). *The cognitive psychology of school learning* (2nd ed.). Boston, MA: Allyn & Bacon.

Loisette, A. (2005). *Assimilative memory or, how to attend and never forget.* New York, NY: Cosimo, Inc.

Rief, S. F. (2008). *The ADD/ADHD checklist: An easy reference for parents and teachers* (2nd ed.). San Francisco, CA: Jossey-Bass.

Styles, E. A. (2006). *The psychology of attention* (2nd ed.). New York, NY: Psychology Press.

Willis, J. (2006). *Research-based strategies to ignite student learning: Insights from a neurologist and classroom teacher.* Alexandria, VA: Association for Supervision & Curriculum Development.

Articles

Becker, M. W. (2009). Panic search, fear produces efficient visual search for nonthreatening objects. *Psychological Science, 20*(4), 435-437. doi:10.1111/j.1467-9280.2009.02303.x

Graham, S., & Golan, S. (1991). Motivational influences on cognition: Task involvement, ego involvement, and depth of information processing. *Journal of Educational Psychology, 83*(2), 187-194. doi:10.1037/0022-0663.83.2.187

Hayden, T. (2001, March 5). Anatomy of a punch line. *U.S. News & World Report, 53.* Retrieved from http://www.usnews.com/usnews/culture/articles/010305/archive_002573.htm

Miller, G. A. (1994). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review, 63*(2), 343-355. doi:10.1037//0033-295X.101.2.343

Posner, M. I., & Petersen, S. E. (2012). The attention system of the human brain: 20 years after. *Annual Review of Neuroscience, 35,* 73-89. doi:10.1146/annurev-neuro-062111-150525

Sylwester, R, & Cho, J. (1992, December/1993, January). What brain research says about paying attention. *Students at Risk, 50*(4), 71-75.

Willis, J. (2010). Want children to "pay attention"? Make their brains curious! *Psychology Today*. Retrieved from http://www.psychologytoday.com/blog/radical-teaching/201005/want-children-pay-attention-make-their-brains-curious

Wyatt, K. (2009, March 7). No chairs: Students 'get the wiggles out' on exercise balls. *USAToday.com*. Retrieved from http://www.usatoday.com/news/education/ 2009-03-07-class-chairs_N.htm

Theme 8: Chunking

Buschke, H., (1976). Learning is organized by chunking. *Journal of Verbal Learning and Verbal Behavior, 15*(3), 313-324. doi:10.1016/0022-5371(76)90028-1

Abstract (quoted from source):

Chunking of items, with further organization of the chunks, has long been supposed to play a significant role in verbal learning. Spontaneous chunking in natural free recall learning is demonstrated directly by identifying clusters of items that recur together in different retrieval attempts, demarcated by different items or clusters. Trial-by-trial delineation of actual chunks and their organization in typical individual learning protocols demonstrates that items are spontaneously clustered into many small recurrent chunks, which remain intact when they are juxtaposed in higher-order organization of the basic chunks. Identification of the actual chunks in each retrieval permits trial-by-trial analysis of organization during verbal learning in terms of both basic clustering and higher-order organization of recurrent, well-defined clusters. Identification of chunking also allows analysis of the increasing rate of retrieval during learning in terms of individual items, items within chunks, and chunks.

Gobert, F., & Simon, H. A. (1988). Expert chess memory: Revisiting the chunking hypothesis. *Memory, 6*(3), 225-255.

Abstract (quoted from source):

After reviewing the relevant theory on chess expertise, this paper re-examines experimentally the finding of Chase and Simon (1973a) that the differences in ability of chess players at different skill levels to copy and to recall positions are attributable to the experts' storage of thousands of chunks (patterned clusters of pieces) in long-term memory. Despite important differences in the experimental apparatus, the data of the present experiments regarding latencies and chess relations between successively placed pieces are highly correlated with those of Chase and Simon. We conclude that the two-second inter-chunk interval used to define chunk boundaries is robust, and that chunks have psychological reality. We discuss the possible reasons why Masters in our new study used substantially larger chunks than the Master of the 1973 study, and extend the chunking theory to take account of the evidence for large retrieval structures (templates) in long-term memory.

Godøy, R. I. (2009). Chunking sound for musical analysis. In S. Ystad, R. Kronland-Martinet, & K. Jensen (Eds.), *Computer music modeling and retrieval. Genesis of meaning in sound and music* (pp. 67-80). New York: Springer.

Abstract (quoted from source):

One intriguing issue in music analysis is that of segmentation, or parsing, of continuous auditory streams into some kinds of meaningful and analytically convenient units, a process that can be denoted as chunking. The purpose of this paper is to present a theory of chunking in musical analysis based on perceptual features of sound and on our own research on musical gestures, suggesting that music-related actions are essential in the process of chunking.

Mathy, F., & Feldman, J. (2012). What's magic about magic numbers? Chunking and data compression in short-term memory. *Cognition, 122*(3), 346-362. doi:10.1016/j.cognition.2011.11.003

Abstract (quoted from source):

Short term memory is famously limited in capacity to magic number 7 ± 2—or, in many more recent studies, about 4 ± 1 "chunks" of information. But the definition of "chunk" in this context has never been clear, referring only to a set of items that are treated collectively as a single unit. We propose a new more quantitatively precise conception of chunk derived from the notion of Kolmogorov complexity and

compressibility: a chunk is a unit in a maximally compressed code. We present a series of experiments in which we manipulated the compressibility of stimulus sequences by introducing sequential patterns of variable length. Our subjects' measured digit span (raw short term memory capacity) consistently depended on the length of the pattern after compression, that is, the number of distinct sequences it contained. The true limit appears to be about 3 or 4 distinct chunks, consistent with many modern studies, but also equivalent to about 7 uncompressed items of typical compressibility, consistent with Miller's famous magical number.

Books

Cowan, N. (2005). *Working memory capacity*. New York, NY: Psychology Press.

Dehn, M. J. (2008). *Working memory and academic learning: Assessment and intervention.* New York, NY: John Wiley & Sons.

Jimenez, R. (2009). *3-Minute e-learning: Rapid learning and applications, amazingly lower cost, and faster speed of delivery.* Los Angeles, CA: Monogatari.

Smith, D. J. (1997). *Chunking and cognitive efficiency: Some lessons from the history of military signalling*. Cardiff, UK: Institute of Higher Education School of Environmental & Human Sciences.

Smith, R. M. (2008). *Conquering the content: A step-by-step guide to online course design.* San Francisco, CA: Jossey-Bass.

Terrance, H. S. (2002). The comparative psychology of chunking. In S. B. Fountain, M. D. Bunsey, J. H. Danks & M. K. McBeath (Eds.), *Animal cognition and sequential behavior: Behavioral, biological, and computational perspective* (pp. 23-55). New York, NY: Springer.

Articles

Buschke, H. (1976). Learning is organized by chunking, *Journal of Verbal Learning and Verbal Behavior*, *15*(3), 313-324. doi:10.1016/0022-5371(76)90028-1

D'Souza, S. (2012). Why chunking down increases your expert status. [Web log post]. Retrieved from http://www.psychotactics.com/blog/infoproducts-chunking-down-expert-status/

Gobet, F., & Simon, H. A. (1998). Pattern recognition makes search possible: Comments on Holding (1992). *Psychological Research*, *61*(3), 204-08.

Johnson, N. F. (1970). The role of chunking and organization in the process of recall. *The Psychology of Learning and Motivation*, *4*, 171-247. doi:10.1016/S0079-7421(08)604326

Scheuer, M. A. (2011). Evaluating book apps for children: pacing and chunking (part 4 in a mini-series). [Web log post]. Retrieved from http://greatkidbooks.blogspot.com/2011/10/evaluating-book-apps-for-children.html

Theme 9: Connection

Connor-Greene, P. A. (2000). Making connections: Evaluating the effectiveness of journal writing in enhancing student learning. *Teaching of Psychology, 27*(1), 44-46. doi:10.1207/S15328023TOP2701_10

Abstract (quoted from source):

Although journal writing has been extensively described and advocated in the teaching literature, little attention has been given to empirical assessment of its effectiveness in increasing student learning. Previous evaluations typically relied on

student and faculty perceptions rather than performance measures. In this article, I describe journal writing as a way to actively engage students in learning about personality theories and include new criteria for instructor evaluation of journal entries. Analysis of student test grades indicated that a journal writing assignment increased student learning, and student evaluations supported the perceived usefulness of this exercise in fostering understanding. Examples from journals illustrate the ways in which students connected the course material to their own observations.

Howe, M., Wimmer, M. C., Gagnon, N., & Plumpton, S. (2009). An associative-activation theory of children's and adults' memory illusions. *Journal of Memory and Language, 60*(2), 229-251. doi:10.1016/j.jml.2008.10.002

Abstract (quoted from source):

The effects of associative strength and gist relations on rates of children's and adults' true and false memories were examined in three experiments. Children aged 5–11 and university-aged adults participated in a standard Deese/Roediger–McDermott false memory task using DRM and category lists in two experiments and in the third, children memorized lists that differed in associative strength and semantic cohesion. In the first two experiments, half of the participants were primed before list presentation with gist-relevant cues and the results showed that: (1) both true and false memories increased with age, (2) true recall was higher than false recall for all ages, (3) at all ages, false memory rates were determined by backward associative strength, and (4) false memories varied predictably with changes in associative strength but were unaffected by gist manipulations (category structure or gist priming). In the third experiment, both gist and associative strength were varied orthogonally and the results showed that regardless of age, children's (5) true recall was affected by gist manipulations (semantic cohesion) and (6) false recall was affected by backward associative strength. These findings are discussed in the context of models of false memory illusions and continuities in memory development more generally.

Kole, J. A., & Healy, A. F. (2007). Using prior knowledge to minimize interference when learning large amounts of information. *Memory Cognition, 35*(1), 124-137. doi:10.3758/BF03195949

Abstract (quoted from source):

In three experiments, we examined mediated learning in situations involving learning a large amount of information. Participants learned 144 "facts" during a learning phase and were tested on facts during a test phase. In Experiments 1 and 2, participants learned facts about familiar individuals, unfamiliar individuals, or unfamiliar individuals associated with familiar individuals. Prior knowledge reduced interference, even when it played only a mediating role. In Experiment 3, participants learned facts about unfamiliar individuals or unfamiliar countries, with half the participants in each group associating the unfamiliar items with familiar individuals. Again, use of prior knowledge to mediate learning reduced interference even when the new information was conceptually dissimilar to the previously known information. These results are consistent with the mental model account of long-term memory.

Lampinen, J. M., Meier, C. R., Arnal, J. D., & Leding, J. K (2005). Compelling untruths: Content borrowing and vivid false memories. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 31*(5), 954-63. doi:10.1037/0278-7393.31.5.954

Abstract (quoted from source):

False memories are sometimes accompanied by surprisingly vivid experiential detail that makes them difficult to distinguish from actual memories. Such strikingly real false memories may be produced by a process called content borrowing in which details from presented items are errantly borrowed to corroborate the occurrence of the false memory item. In 2 experiments using think-out-loud protocols at both study and test, evidence for content borrowing occurred for more than half of the false remember judgments participants reported. The present study also provides evidence consistent with recollection rejection and distinctiveness playing a role in false-memory editing.

Silverman, L. H. (1997). Personalizing the past: A review of literature with implications for historical interpretation. *Journal of Interpretation Research,* 2(1), 1-12.

Abstract (quoted from source):

The recent perspective known as meaning-making has advanced the belief that understanding interpretive site visitors' frameworks and past experiences is critical to successful interpretation. How, then, do visitors make meaning of heritage site experiences and of the past in general? This review examines and synthesizes recent studies and considers their contribution to theory and practice of historical interpretation. In sum, research suggests three major realms of experience from which visitors draw schemata that inform meaning-making at heritage sites: (a) associations with knowledge of history, (b) experiences and behavior regarding the past in everyday life, and (c) expectations of and behavior at heritage sites. Using literature as groundwork, three strategies for empirically driven historical interpretation are presented; (a) addressing the nature of history and visitors' associations, (b) incorporating everyday life behaviors, and (c) interpreting for social nature of heritage site visit.

Wisniewski, E. J. (1995). Prior knowledge and functionally relevant features in concept learning. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 21*(2), 449–468. doi:10.1037//0278-7393.21.2.449

Abstract (quoted from source):

Empirical learning models have typically focused on statistical aspects of features (e.g., cue and category validity). In general, these models do not address the contact between people's prior knowledge that lies outside the category and their experiences of the category. Varieties of extensions to these models are examined, which combine prior knowledge with empirical learning. Predictions of these models were compared in 4 experiments. These studies contrasted the cue and category validity of features with people's prior knowledge about the relevance of features to the functions of novel artifacts. The findings suggest that the influences of knowledge and experience are more tightly integrated than some models would predict. Furthermore, relatively straightforward ways of incorporating knowledge into an empirical learning algorithm appear insufficient (e.g., use of knowledge to weight features by general relevance or to individually weight features). Other extensions to these models are suggested that focus on the importance of intermediary features, coherence, and conceptual roles.

Books

Caine, R. N., & Caine, G. (1991) *Making connections: Teaching and the human brain*. Alexandria, VA: Association for Supervision and Curriculum Development.

Morrell, E. (2004). *Linking literacy and popular culture: Finding connections for lifelong learning*. Norwood, MA: Christopher-Gordon Publishers.

Parks, S., & Black, H. (1992). *Organizing thinking: Book 1: Graphic organizers.* Pacific Grove, CA: Critical Thinking & Software.

Tileston, D. E. W. (2010) *Ten best teaching practices: How brain research, learning styles, and standards define teaching competencies* (3rd ed.). Thousand Oaks, CA: Corwin Press

Articles

Bain, R. (2010). "I gotta learn all that stuff?" "Well, I have to teach it all!": Managing the laments of world history teachers. *Social Studies Review, 49*(1), 30-38.

Chi, M. T. H., & Ceci, S. J. (1987). Content knowledge: Its role, representation, and restructuring in memory development. *Advances in Child Development and Behavior, 20,* 91-141. doi:10.1016/S0065-2407(08)60401-2

Correia, M. G. & Bleicher, R. E. (2008). Making connections to teach reflection. *Michigan Journal of Community Service Learning, 14*(2), 41-49.

Dilek, D. (2009). The reconstruction of the past through images: An iconographic analysis on the historical imagination usage skills of primary school pupils. *Educational Sciences: Theory and Practice, 9*(2), 665-689.

Kusnick, J. (2002). Growing pebbles and conceptual prisms - Understanding the source of student misconceptions about rock formation. *Journal of Geoscience Education*, *50*(1), 31-39.

McLaughling, B. (1992). Myths and misconceptions about second language learning: What every teacher needs to unlearn. Retrieved from http://www.usc.edu/dept/education/CMMR/FullText/McLauglinMyths.pdf

Theme 10: Practice

Holland, G. A. (1953). The effects of a change from distributed to massed responses. *Journal of Comparative and Physiological Psychology, 46(*4), 267-270. doi:10.1037/h0062421

Abstract (quoted from source):

Animals matched on the basis of preliminary training on two lever-pressing responses were trained either by massed or distributed practice on one of the two responses, and both groups were given a final test with a block of massed choices. The massed-practice group "tended toward a decrease in the percentage of rewarded responses at the outset of the final block of trials but recovered in 15 to 20 trials. The second group showed a gradual decrease in percentage of rewarded responses over the first 20 trials of the final massed block, followed by a gradual increase." The results are discussed in terms of the concept of a constant cumulative stimulus trace.

Metalis, S. A. (1985). Effects of massed versus distributed practice on acquisition of video game skill. *Perceptual and Motor Skills, 61*(2), 457-458. doi:10.2466/pms.1985.61.2.457

Abstract (quoted from source):

45 Ss played a video game 10 times in succession. The 22 distributed-practice Ss were given a newspaper to read for 2 min between games. To equate pre-experimental between-S differences in video-game-playing skill, the 1st game's performance scores were subtracted from each of the other 9 scores to yield change

scores. The means of both indexes, computed across Ss for each of the 9 game change scores, showed marked improvement for all Ss; however, the distributed-practice group consistently showed more improvement.

Nash, C. S., Sproule, J., & Horton, P. (2011). Excellence in coaching: The art and skill of elite practitioners. *Research Quarterly for Exercise and Sport, 82*(2), 229-238. doi:10.5641/027013611X13119541883744

Abstract (quoted from source):

During this study, 10 expert coaches were interviewed to examine their views on aspects of their individual coaching practice. Four themes emerged from the interviews: (a) the long-term approach, (b) the authentic coaching environment, (c) creating a learning environment, and (d) the quality and quantity of training sessions. These coaches were consistent in their attempts to facilitate learning experiences for the athletes, while setting high standards in both training and competition. The study's findings show that expert coaches have to orchestrate a large number of variables when planning and executing a training session, and their success depends on their coaching knowledge and their skill at contextualizing the necessary components for specific situations.

Rohrer, D., & Taylor, K. (2006). The effects of overlearning and distributed practice on the retention of mathematics knowledge. *Applied Cognitive Psychology, 20*(9), 1209-1224. doi:10.1002/acp.1266

Abstract (quoted from source):

In two experiments, 216 college students learned a mathematical procedure and returned for a test either one or four weeks later. In Experiment 1, performance on the four-week test was virtually doubled when students distributed 10 practice problems across two sessions instead of massing the same 10 problems in one session. This finding suggests that the benefits of distributed practice extend to abstract mathematics problems and not just rote memory cognitive tasks. In Experiment 2, students solved 3 or 9 practice problems in a single session, but this manipulation had no effect on either the one-week or four-week test. This result is at odds with the virtually unchallenged support for the strategy of continuing practice beyond the point of mastery in order to boost long-term retention. The results of both experiments suggest that the organization of practice problems in most mathematics textbooks is one that minimizes long-term retention.

Seabrook, R., Brown, G. D. A., & Solity, J. E. (2005). Distributed and massed practice: From laboratory to classroom. *Applied Cognitive Psychology, 19*(1), 107-122. doi:10.1002/acp.1066

Abstract (quoted from source):

The benefit to memory of spacing presentations of material is well established but lacks an adequate explanation and is rarely applied in education. This paper presents three experiments that examined the spacing effect and its application to education. Experiment 1 demonstrated that spacing repeated presentations of items is equally beneficial to memory for a wide range of ages, contrary to some theories. Experiment 2 introduced 'clustered' presentations as a more relevant control than massed, reflecting the fact that massed presentation of material is uncommon in education. The scheduling of clustered presentations was intermediate between massed and distributed, yet recall was no different than for massed. Experiment 3, a classroom-based study, demonstrated the benefit of distributed over clustered teaching of reading through modification of the scheduling of everyday lessons. Thus, the effectiveness of teaching may be improved by increasing the degree to which lessons are distributed.

Topping, K. J., Samuels, J., & Paul, T. (2007). Does practice make perfect? Independent reading quantity, quality, and student achievement. *Learning and Instruction*, *17*(3), 253-264. doi:10.1016/j.learninstruc.2007.02.002

Abstract (quoted from source):

Does reading practice make perfect? Or is reading achievement related to the quality of practice as well as the quantity? To answer these questions, data on 45,670 students in grades 1-12 who read over 3 million books were analyzed. Measures largely of quantity (engaged reading volume) and purely of quality (success in reading comprehension) showed a positive relationship with achievement gain at all levels of achievement. However, both high quantity and high quality in combination were necessary for high achievement gains, especially for older students. Both were weakly associated with student initial reading achievement, but more strongly associated with the classroom in which the student was enrolled, possibly suggesting the properties of teacher intervention in guiding independent reading were important. Implications for theory building, research, and practice are explored.

Books

Browne, S., Clarke, D., Henson, P., Hristofski, F., & Jeffreys, V. (2010). *PDHPE application and inquiry: HSC course.* Sydney, Australia: Oxford University Press.

Hopper, C. H. (2010). *Practicing college learning strategies* (5th ed.). Belmont, CA: Wadsworth, Cengage Learning.

Marzano, R. J., Pickering, D. J., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: Association for Supervision and Curriculum Development.

Schmidt, R. A. (1991). *Motor learning & performance: From principles to practice.* Champaign, IL: Human Kinetics Publishers.

Sousa, D. A. (2001). *How the brain learns: A classroom teacher's guide.* Thousand Oaks, CA: Corwin Press.

Wong, L. (2008). *Essential study skills* (6th ed.). Boston: Houghton Mifflin Harcourt.

Articles

Dempster, F. N. (1988) The spacing effect: A case study in the failure to apply the results of psychological research. *American Psychologist, 43*(8), 627-34. doi:10.1037/0003-066X.43.8.627

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 79*(Supplement), 70-81. doi:10.1097/00001888-200410001-00022

Hammel, B. (1989). *A compendium of practice methods and their application to the bassoon.* (Doctoral dissertation, Florida State University, Tallahassee, FL). Retrieved from http://www.people.vcu.edu/~bhammel/main/treatise/ Bruce%20Hammel%20treatise.pdf.

Murry, S. R., & Udderman, B. E. (2003). Massed versus distributed practice: Which is better? *CAHPERD: California Association for Health, Physical Education, Recreation and Dance Journal, 28*(1), 19-22.

Roediger III, H. L., & Karpicke, J. D. (2002). The power of testing memory: Basic research and implications for educational practice. *Perspectives on Psychological Science, 1*(3), 181-210.

Willingham, D. T. (2002). How we learn: Ask the cognitive scientist. *American Educator, 26*(2), 37-39, 47.

Theme 11: Personal Relevance

Dabbagh, N. (1996). *Creating personal relevance through adapting an educational task, situationally, to a learner's individual interests.* Retrieved from ERIC database. (ED397787)

Abstract (quoted from source):

Mandatory introductory level college courses, or "service courses," tend to be taught in lecture format, in a linear order from the instructor's point of view, and to classes of anywhere from 50 to 600 or more students. Students have individual differences and diverse learning styles which are difficult to address in a large class. Computer-based instruction can help overcome these constraints by adapting the content of the basic required courses to contexts relevant for the student, and by allowing the student to choose the most personally relevant context at the time of instruction. The learner-controlled format allows learner choice of lesson sequence, pacing, content, and other instructional variables that are adaptive to cognitive styles and prior *knowledge. This gives the learner a sense of ownership of content, promoting relevancy and knowledge acquisition. A theoretical framework and foundational research are discussed. A pilot study was conducted of undergraduate students enrolled in a required introductory computer science class.A pre-attitude survey contained questions about demographics and most and least preferred context. The subjects were randomly assigned to three treatment groups, in which subjects were administered the program through: (1) their most preferred choice of context, (2) their least preferred choice of context, and (3) the abstract lesson, with no context. An attitude/motivation survey was conducted before and after the instruction to assess changes in students' attitudes/ motivation towards the subject matter. A no-context achievement post-test testing recall, application, synthesis, and evaluation of the concepts learned in the lesson were also given to all participants.*

Liberman, A., & Chaiken, S. (1996).The direct effect of personal relevance on attitudes. *Personality and Social Psychology Bulletin, 22*(3), 269-279. doi:10.1177/0146167296223005

Abstract (quoted from source):

The personal relevance of several academic and public policy proposals was manipulated, in the absence of any persuasive message, in two studies using a survey methodology and in two laboratory studies. Results generally showed that high personal relevance attitudes differed from low personal relevance attitudes. These results seem to indicate that a high-relevance version of a policy proposal is not the same attitude object as the low-relevance version of the same proposal. In expectancy-value terms, relevance manipulations may affect the valued consequences of a policy that come to mind. Framing a question in high-versus low-relevance terms can increase the accessibility of different object attributes. Implications for interpreting personal relevance findings in persuasion research are also discussed.

Lyons, I. M., Mattarella-Micke, A., Cieslak, M., Nusbaum, H. C., Small, S. L., & Beilock, S. L. (2010) The role of personal experience in the neural processing of action-related language. *Brain and Language, 112*(3) 214-22. doi:10.1016/j.bandl.2009.05.006

Abstract (quoted from source):

We investigated how auditory language processing is modified by a listener's previous experience with the specific activities mentioned in the speech. In particular, we asked whether neural responses related to language processing depend on one's experience with the action-based content of this language. Ice hockey players and novices passively listened to sentences about ice hockey and everyday situations during functional magnetic resonance imaging (fMRI). When listening to action-related sentences, neural activation in left inferior frontal gyrus (IFG) and left dorsal premotor cortex (PMd) depended on one's actual (physical) experience with the action described in the sentence: hockey experts showed greater activity in these regions than novices for hockey sentences, but not for everyday-action sentences. Thus, personal experience with linguistic content modulated activity both in regions associated with language comprehension (IFG) and in those related to complex action planning (PMd). Moreover, hockey experts (who have extensive experience with both hockey and everyday situations) showed greater activity in left IFG regions for hockey relative to everyday sentences. This suggests that the degree to which one finds information personally relevant (i.e., over and above one's direct experience with it) also modulates processing in brain regions related to semantic-level processing

Radio Ad Effectiveness Lab, Inc. (2003). *Personal relevance, personal connections; How radio ads affect consumers.* Retrieved from http://www.radioadlab.org/ studyDocs/relevanceFull.pdf

Abstract (quoted from source):

In this new RAEL study, the most distinctive media perception we saw among consumers 18-54 is that radio's value to listeners comes from its satisfaction of very personal wants and needs, and as a result, radio listening is very connected to a listener's emotions. That carries over to their perceptions and their expectations of radio advertising. Radio ads are perceived as (and expected to be) more relevant to the listener than are those in television or newspapers, and radio ads are therefore fully capable of tapping into emotional responses.

Turk, D. J., van Bussel, K., Brebner, J., Toma, A., Krigolson, O., & Handy, T. (2011). When "It" becomes "Mine": Attentional biases triggered by object ownership. *Journal of Cognitive Neuroscience, 23*(12), 3725-3733. doi:10.1162/jocn_a_00101

Abstract (quoted from source):

Previous research has demonstrated that higher-order cognitive processes associated with the allocation of selective attention are engaged when highly familiar self-relevant items are encountered, such as one's name, face, personal possessions, and the like. The goal of our study was to determine whether these effects on attentional processing are triggered on-line at the moment self-relevance is established. In a pair of experiments, we recorded ERPs as participants viewed common objects (e.g., apple, socks, and ketchup) in the context of an "ownership" paradigm, where the presentation of each object was followed by a cue indicating whether the object nominally belonged either to the participant (a "self" cue) or the experimenter (an "other" cue). In Experiment 1, we found that "self" ownership cues were associated with increased attentional processing, as measured via the P300 component. In Experiment 2, we replicated this effect while demonstrating that at a visual-perceptual level, spatial attention became more narrowly focused on objects owned by self, as measured via the lateral occipital P1 ERP component. Taken together, our findings indicate that self-relevant attention effects are triggered by the act of taking ownership of objects associated with both perceptual and postperceptual processing in cortex.

Books

Committee on Increasing High School Students' Engagement and Motivation to Learn, National Research Council. (2003) *Engaging schools: Fostering high school students' motivation to learn.* Washington, DC: The National Academies Press.

Daggett, W. R., & Nussbaum, P. D. (2008). *What brain research teaches about rigor, relevance, and relationships: And what it teaches about keeping your own brain healthy.* Rexford, NY: International Center for Leadership in Education.

Maasz, J., & Schloeglmann, W. (Eds.). (2009). *Beliefs and attitudes in mathematics education: New research results.* Rotterdam, Netherlands: Sense Publishers.

Manners, T. (2008). *Relevance: Making stuff that matters.* New York, NY: Penguin Group.

Willis, J. (2007). *Brain-friendly strategies for the inclusion classroom: Insights from a neurologist and classroom teacher*. Alexandria, VA: Association for Supervision and Curriculum Development.

Articles

Bernard, S. (2010, December 1). Science shows making lessons relevant really matters. Retrieved from http://www.edutopia.org/neuroscience-brain-based-learning-relevance-improves-engagement.

Mandler, D., Mamlok-Naaman, R., Blonder, R., Yayon, M., & Hofstein, A. (2012). High-school chemistry teaching through environmentally oriented curricula. *Chemistry Education Research and Practice, 13*(2), 80-92. doi:10.1039/C1RP90071D.

Rankins-Robertson, S., Cahill, L., Roen, D., & Glau, G. R. (2010). Expanding definitions of academic writing: Family history writing in the basic writing classroom and beyond. *Journal of Basic Writing (CUNY), 29*(1), 56-77.

Van Lancker, D. (1991). Personal relevance and the human right hemisphere. *Brain and Cognition, 17*(1), 64-92. doi:10.1016/0278-2626(91)90067-I.

VanSickle, R. L. (1990). The personal relevance of the social studies. *Social Education, 54*(1), 23-27.

Yager, R. E. (1989). A rationale for using personal relevance as a science curriculum focus in schools. *School Science and Mathematics, 89*(2), 144-156. doi:10.1111/j.1949-8594.1989.tb11902.x.

Theme 12: Locale Memory

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22*(4), 577-660. doi:10.1017/S0140525X99002149

Abstract (quoted from source):

Prior to the twentieth century, theories of knowledge were inherently perceptual. Since then, developments in logic, statistics, and programming languages have inspired amodal theories that rest on principles fundamentally different from those underlying perception. In addition, perceptual approaches have become widely viewed as untenable because they are assumed to implement recording systems, not conceptual systems. A perceptual theory of knowledge is developed here in the context of current cognitive science and neuroscience. During perceptual experience, association areas in the brain capture bottom-up patterns of activation in sensory-motor areas. Later, in a top-down manner, association areas partially reactivate sensory-motor areas to implement perceptual symbols. The storage and reactivation of perceptual symbols operates at the level of perceptual components – not at the level of holistic perceptual experiences. Through the use of selective attention, schematic representations of perceptual components are extracted from experience and stored in memory (e.g., individual memories of green, purr, hot). As memories of the same component become organized around a common frame, they implement a simulator that produces limitless simulations of the component (e.g., simulations of purr). Not only do such simulators develop for aspects of sensory experience, they also develop for aspects of proprioception (e.g., lift, run) and introspection (e.g., compare, memory, happy, hungry). Once established, these simulators implement a basic conceptual system that represents types, supports categorization, and produces categorical inferences. These simulators further support productivity, propositions, and abstract concepts, thereby implementing a fully functional conceptual system. Productivity results from integrating simulators combinatorially and recursively to produce complex simulations. Propositions result from binding simulators to perceived individuals to represent type-token relations. Abstract concepts are grounded in complex simulations of combined physical and introspective events. Thus, a perceptual theory of knowledge can implement a fully functional conceptual system while avoiding problems associated with amodal symbol systems. Implications for cognition, neuroscience, evolution, development, and artificial intelligence are explored.

Dere, E., Kart-Teke, E., Huston, J. P., & De Souza Silva, M. A. (2006). The case for episodic memory in animals. *Neuroscience & Biobehavioral Reviews, 30*(8), 1206-1224. doi:10.1016/j.neubiorev.2006.09.005

Abstract (quoted from source):

The conscious recollection of unique personal experiences in terms of their details (what), their locale (where) and temporal occurrence (when) is known as episodic memory and is thought to require a 'self-concept', autonoetic awareness/conciousness, and the ability to subjectively sense time. It has long been held that episodic memory is unique to humans, because it was accepted that animals lack a 'self-concept', 'autonoetic awareness', and the ability to 'subjectively sense time'. These assumptions are now being questioned by behavioral evidence showing that various animal species indeed show behavioral manifestations of different features of episodic memory such as, e.g. 'metacognition', 'conscious recollection' of past events, 'temporal order memory', 'mental time travel' and have the capacity to remember personal experiences in terms of what happened, where and when. The aim of this review is to provide a comprehensive overview on the current progress in attempts to model different prerequisites and features of human episodic memory in animals and to identify possible neural substrates of animal episodic memory. The literature covered includes behavioral and physiological studies performed with different animal species, such as non-human primates, rodents, dolphins and birds. The search for episodic memory in animals has forced researchers to define objective behavioral criteria by which different features of episodic memory can be operationalized experimentally and assessed in both animals and humans. This is especially important because the current definition of episodic memory in terms of mentalistic constructs such as 'self', 'autonoetic awareness/consciousness', and 'subjectively sensed time', not only hinders animal research on the neurobiology of episodic memory but also research with healthy human subjects as well as neuropsychiatric patients with impaired language or in children with less-developed verbal abilities.

Eichenbaum, H. (2010). Memory systems. *Wiley Interdisciplinary Reviews: Cognitive Science, 1*(4), 478-490. doi:10.1002/wcs.49

Abstract (quoted from source):

The idea that there are multiple memory systems can be traced to early philosophical considerations and introspection. However, the early experimental work considered memory a unitary phenomenon and focused on finding the mechanism upon which *memory is based. A full reconciliation of debates about that mechanism, and a coincidental rediscovery of the idea of multiple memory systems, emerged from studies in the cognitive neuroscience of memory. This research has identified three major forms of memory that have distinct operating principles and are supported by different brain systems. These include: (1) a cortical-hippocampal circuit that mediates declarative memory, our capacity to recollect facts and events; (2) procedural memory subsystems involving a cortical-striatal circuit that mediates habit formation and a brainstem-cerebellar circuit that mediates sensorimotor adaptations; and (3) a circuit involving subcortical and cortical pathways through the amygdala that mediates the attachment of affective status and emotional responses to previously neutral stimuli.*

Eichenbaum, H., Schoenbaum, G., Young, B., & Bunsey, M. (1996). Functional organization of the hippocampal memory□system. *PNAS: Proceedings of the National Academy of Sciences, 93*(24), 13500-13507. doi:10.1073/pnas.93.24.13500

Abstract (quoted from source):

In humans declarative or explicit memory is supported by the hippocampus and related structures of the medial temporal lobe working in concert with the cerebral cortex. This paper reviews our progress in developing an animal model for studies of cortical–hippocampal interactions in memory processing. Our findings support the view that the cortex maintains various forms of memory representation and that hippocampal structures extend the persistence and mediate the organization of these codings. Specifically, the parahippocampal region, through direct and reciprocal interconnections with the cortex, is sufficient to support the convergence and extended persistence of cortical codings. The hippocampus itself is critical to the organization cortical representations in terms of relationships among items in memory and in the flexible memory expression that is the hallmark of declarative memory.

Books

Caine, R. N., & Caine, G. (2011). *Natural learning for a connected world: Education, technology and the human brain*. New York, NY: Teachers College Press.

Foer, J. (2011). *Moonwalking with Einstein: The art and science of remembering everything*. New York, NY: Penguin Group.

Gilbert, A. G. (1976). *Teaching the three Rs through movement experiences: A handbook for teachers*. New York, NY: Macmillan Publishing.

Sousa, D. A. (2006). *How the brain learns*. Thousand Oaks, CA: Corwin Press.

Articles

Burg, J. J., & Luttringhaus, K. (2006). Entertaining with science, educating with dance. *Computers in Entertainment, 4*(2), 7. doi:10.1145/1129006.1129018

Fahey, J. A., & De Los Santos, G. (2002). Memory improvement and research related to the science of memory. *Education-Indianapolis then Chula Vista, 123*(2), 380-385.

Knapp, C. E. (1992). Thinking in outdoor inquiry. *ERIC Clearinghouse on Rural Education and Small Schools*. Retrieved from ERIC database. (ED348198)

Mathison, C., Wachowiak, S., & Feldman, L. (2007). School in the park: Bridging formal and informal learning environments. *Childhood Education, 83*(4), 206-210.

Randall, C. C. (1996). *Haptic history: Teaching A.P. U.S. history through kinesthetic learning and material culture*. Retrieved from ERIC database. (ED423152)

Smith, G. A. (2002). Place-based education: Learning to be where we are. *Phi Delta Kappan, 83*(8), 584-594.

Theme 13: Mental Models

Algozzine, B., & Douville, P. (2004). Use mental imagery across the curriculum. *Preventing School Failure: Alternative Education for Children and Youth. 49*(1), 36-39. doi:10.3200/PSFL.49.1.36

Abstract (quoted from source):

Contemporary trends in education reflect a shift from traditional teacher-centered approaches to more student-centered approaches to learning. Empowering students in their own learning is facilitated by teaching them effective meaning-making strategies that support active participation in their own learning. Making this happen requires using "double-duty" instructional strategies that are effective instructional tools for teachers and effective learning tools for students when they work independently without continuous monitoring, feedback, and support. These approaches are popular because they are also effective when used across the curriculum in multiple content areas or disciplines (e.g., in both reading and mathematics instruction as well as in science and social studies). Mental imagery is an effective double duty instructional strategy. In this article, the authors describe a specific mental imagery strategy, the Sensory Activation Model (SAM), developed to assist students in constructing their own images as problem-solving tools. The SAM strategy has been demonstrated to aid students in the construction of self-generated images that facilitate both the reading and writing processes.

Bartel, C. A., & Garud, R. (2009). The role of narratives in sustaining organizational innovation. *Organization Science, 20*(1), 107-117. doi:10.1287/orsc.1080.0372

Abstract (quoted from source):

Sustaining innovation is a vital yet difficult task. Innovation requires the coordinated efforts of many actors to facilitate (1) the recombination of ideas to generate novelty, (2) real-time problem solving, and (3) linkages between present innovation efforts with past experiences and future aspirations. We propose that innovation narratives are cultural mechanisms that address these coordination requirements by enabling translation. Specifically, innovation narratives are powerful mechanisms for translating ideas across the organization so that they are comprehensible and appear legitimate to others. Narratives also enable people to translate emergent situations that are ambiguous or equivocal so as to promote real-time problem solving. With

their accumulation, innovation narratives provide a generative memory for organizations that enable people to translate ideas accumulated from particular instances of past innovation to inform current and future efforts.

Dilber, R, & Bahattin, D. (2008). Effectiveness of analogy on students' success and elimination of misconception. *Latin-American Journal of Physics Education, 2*(3), 174-183.

Abstract (quoted from source):

This study investigated the effects of analogy instruction on students' success and removing misconceptions as compared with traditional instruction. The sample of this study consisted of 78 high school students from two classes enrolled in an introductory physics course. These students are about 15-16 years old. One of the classes was assigned randomly to the control group, and the other class was assigned to the experimental group. During teaching the topic of electric concepts in the physics curriculum, analogical instruction was applied in the experimental group whereas traditional instruction was followed in the control group. The results showed that the students in the experimental group performed better with respect to electric concepts than control groups' students.

Gobert, J., & Clement, J. (1999). Effects of student-generated diagrams versus student-generated summaries on conceptual understanding of causal and dynamic knowledge in plate tectonics. *Journal of Research in Science Teaching, 36*(1), 39-53. doi:10.1002/(SICI)1098-2736(199901)36:1<39::AID-TEA4>3.3.CO;2-9

Abstract (quoted from source):

This article examines the beneficial effects of student-generated diagrams versus student-generated summaries on conceptual understanding on the topic of plate tectonics. A group of fifth grade students were asked to read text about plate tectonics. One segment of the group was asked to draw diagrams about the material, another was asked to write summaries and the third group simply read the text (control group). While the summaries themselves contained more information than the diagrams, the students who drew the diagrams outperformed both of the other groups on the posttest given to determine understanding of the topic. These results

are discussed in the context of how they impact on-line reading comprehension and conceptual understanding of a domain.

Mayer, R. E., & Anderson, R. B. (1992). The instructive animation: Helping students build connections between words and pictures in multimedia learning. *Journal of Educational Psychology, 84*(4), 444-452. doi:10.1037//0022-0663.84.4.444

Abstract (quoted from source):
In 2 experiments, Ss studied an animation depicting the operation of a bicycle tire pump or an automobile braking system, along with concurrent oral narration of the steps in the process (concurrent group), successive presentation of animation and narration (by 4 different methods), animation alone, narration alone, or no instruction (control group). On retention tests, the control group performed more poorly than each of the other groups, which did not differ from one another. On problem-solving tests, the concurrent group performed better than each of the other groups, which did not differ from one another. These results are consistent with a dual-coding model in which retention requires the construction of representational connections and problem solving requires the construction of representational and referential connections. An instructional implication is that pictures and words are most effective when they occur contiguously in time or space.

Suh, J., & Moyer, P. S. (2007). Developing students' representational fluency using virtual and physical algebra balances. *Journal of Computers in Mathematics and Science Teaching, 26*(2), 155-173.

Abstract (quoted from source):
Both virtual and physical manipulatives are reported as effective l earning tools when used with different groups of students in a variety of contexts to learn mathematical content. The use of multiple representations and the flexibility to translate among those representational forms facilitates students' learning and has the potential to deepen their understanding. This classroom project involved two groups of third-grade students in a week-long unit focusing on algebraic relationships. The purpose of the unit was to engage students with different algebraic models and encourage students to use informal strategies to represent their relational thinking. The paper highlights examples of these student representations as evidence of the children's developing algebraic thinking. Result from the pre and posttest measures showed that students in the physical and virtual manipulative environments gained significantly in

achievement and showed flexibility in translating and representing their understanding in multiple representations: manipulative model, pictorial, numeric, and word problems. These results show that although the different manipulative models had different features, both the physical and virtual environments were effective in supporting students' learning and encouraging relational thinking and algebraic reasoning.

Books

Baines, L. A. (2008). *Teacher's guide to multisensory learning: Improving literacy by engaging the senses.* Alexandria, VA: Association for Supervision and Curriculum Development.

Johnson-Laird, P. (1983). *Mental models.* Cambridge, MA: Harvard University Press.

Marzano, R. J., Pickering, D., & Pollock, J. E. (2001). *Classroom instruction that works: Research-based strategies for increasing student achievement.* Alexandria, VA: Association for Supervision and Curriculum Development.

Payne, R. K. *Understanding learning: The how, the why, the what.* Highlands, TX: Aha! Process.

Pink, D. H.(2006). *A whole new mind: Why right-brainers will rule the future.* New York, NY: Penguin Group.

Wolfe, P. (2001). *Brain matters: Translating research into classroom practice.* Alexandria, VA: Association for Supervision and Curriculum Development.

Articles

Costa, A. L. (2008). The thought-filled curriculum. *Educational Leadership, 65*(5), 20-24.

Eldon, D. (2012, July 25). Lyrical learning: Why it works. *Lyrical Learning*. Retrieved from http://www.lyricallearning.com/why.html

Fahey, J. A., & De Los Santos, G. (2002). Memory improvement and research related to the science of memory. *Education (Chula Vista), 123*(2), 380-385.

Glynn, S. (2007). The teaching-with-analogies model. *Science and Children, 44*(8), 52-55.

Jones, B. F., Pierce, J., & Hunter, B. (1988). Teaching students to construct graphic representations. *Educational Leadership, 46*(4), 20-25.

Snowden, D. (1999). Story telling: An old skill in a new context. *Business Information Review, 16*(1), 30-37 doi:10.1177/0266382994237045.

Theme 14: First Time Learning

Anderson, N. H., (1965). Primacy effects in personality impression formation using a generalized order effect paradigm. *Journal of Personality and Social Psychology, 2*(1), 1-9. doi:10.1037/h0021966

Abstract (quoted from source):

Ss were read a set of personality trait adjectives, and judged how much they would like a person so described. A generalized order effect paradigm was used. Each set consisted of a sequence of high (or low) value adjectives; into this sequence a block of 3 low (or high) adjectives was interpolated at all possible ordinal positions. The results showed a straight-line primacy effect: the net influence of an adjective decreased linearly with ordinal position in the set. It was shown that the response to a set could be described as a weighted average of the scale values of the separate adjectives. This model was related to a previously employed linear model for opinion change.

Castro, C. A. & Larsen, T. (1992). Primacy and recency effects in nonhuman primates. *Journal of Experimental Psychology: Animal Behavior Processes, 18*(4), 335-340. doi:10.1037//0097-7403.18.4.335

Abstract (quoted from source):

The reports of primacy and recency memory effects in nonhuman primates have been criticized because they have all used an initiating response. That is, the presentation of the to-be-remembered list of items was always contingent on a response being initiated by the nonhuman primate. It has been argued that this initiating response improves performance for early items in the list, resulting in the occurrence of the primacy effect, independent of any memory processing mechanism. This criticism was addressed in the present study by not using an initiating response prior to the presentation of the list. Nevertheless, both a primacy and a recency effect were observed in all 6 rhesus monkeys evaluated using a serial probe recognition task. Thus, the results are similar to those for humans, in that both primacy and recency effects can be obtained in nonhuman primates. A brief literature review is included, and it is proposed that the primacy and recency effects observed in humans, nonhuman primates, and infraprimates can be explained within the context of the configural-association theory

Digirolamo, G. J., & Hintzman, D. L. (1997). First impressions are lasting impressions: A primacy effect in memory for repetitions. *Psychonomic Bulletin and Review*, *4*(1), 121-124. doi:10.3758/BF03210784

Abstract (quoted from source):

Two experiments demonstrated that the encoding of a repeated object is biased toward the attributes of its first presentation. In Experiment 1, subjects saw objects five times each, but either the first presentation or the fifth presentation was the mirror reverse of the standard orientation seen on the other four trials. When recognition was tested with both orientations simultaneously, subjects reported seeing only the single mirror-reverse orientation more often if it was the first presentation than when it was the fifth presentation, and seeing only the standard orientation more often if it was presentations 1-4 than when it was presentations 2-5. A second experiment demonstrated that this primacy effect generalized to size changes. This pattern of results is consistent with the hypothesis that top-down biases affect what subjects learn: The first representation established for a stimulus is likely to influence the encoding of subsequent repetitions.

Garskof, B. E., Bryan, T. M. (1966). Unlearning as a function of degree of original learning and retention test. *Psychonomic Science, 6*(8), 391-392.

Abstract (quoted from source):

Three degrees of original learning and two retention tests were used to explore the relationship between degree of original learning and resistance to unlearning. It was found that scores on both retention tests varied directly with degree of original learning suggesting that greater original learning practice led to increased resistance to unlearning during interpolated learning.

Simmons, R. (1988). Patterns of misunderstanding: An integrative model for science, math, and programming. *Review of Educational Research, 58*(4), 303-326.

Abstract (quoted from source):

This article examines unifying factors among diverse problems of understanding in several fields. Certain misunderstandings in science, mathematics, and computer programming display strong structural analogies with one another. Even within one of these domains, however, not all misunderstandings are structurally similar. To explain the commonality and variety, four levels of knowledge are posited: (a) content, (b) problem-solving, (c) epistemic, and (d) inquiry. Through analysis of several examples, it is argued that misunderstandings have causes at multiple levels, with highly domain-specific causes predominant at the "content" level and somewhat more general causes at the other levels. The authors note that education characteristically neglects all but the content level, describe successful interventions at all levels, and urge more attention in education to integration across the levels.

Books

Horn, G. (1985). *Memory, imprinting, and the brain: An inquiry into mechanisms.* Oxford, UK: Clarendon Press.

Lorenz, K. (1971). *Studies in animal and human behaviour, Volume 1.* Cambridge, MA: Harvard University Press.

McClelland, J. L., & Siegler, R. S. (2011). *Mechanisms of cognitive development: Behavioral and neural perspectives*. Mahwah, NJ: Lawrence Erlbaum Associates.

Miller, R. M. (2003). *Imprint training of the newborn foal: A swift, effective method for permanently shaping a horse's lifetime behavior*. Colorado Springs, CO: Western Horseman.

Montangero, J., & Maurice-Naville, D. (1997). *Piaget, or the advance of knowledge*. Mahwah, NJ: Lawrence Erlbaum Associates.

Nierenberg, G. I. (1996). *Do it right the first time: A short guide to learning from your most memorable errors, mistakes, and blunders*. New York, NY: John Wiley and Sons.

Sluckin, W. (2007). *Imprinting and early learning* (2nd ed.). Piscataway, NJ: Transaction Publishers.

Articles

Cardoso, S. H., & Sabbatini, R. M. E. (2001, November 4). Learning who is your mother -The behavior of imprinting. *Brain and Mind Electronic Magazine on Neuroscience, 14*. Retrieved from http://www.cerebromente.org.br/n14/experimento/lorenz/index-lorenz.html

Eick, C. J., Ware, F. N., & Williams, P. G. (2003). Coteaching in a science methods course: A situated learning model of becoming a teacher. *Journal of Teacher Education*, *54*(1), 74-85. doi:10.1177/0022487102238659

Fogleman, S. L. (2012, July 31). Effective training. *AgManager.info*. Retrieved from http://www.agmanager.info/hr/management/Effective_Training.pdf

Grotzer, T. A., & Bell, B. (1999). Negotiating the funnel: Guiding students toward understanding elusive generative concepts. *The Project Zero classroom: Views on understanding*. Cambridge, MA: Fellows and Trustees of Harvard College.

McWilliam, E. L. (2005). Unlearning pedagogy. *Journal of Learning Design, 1*(1), 1-11.

Theme 15: Neural Downshifting

Dickey, M. D. (2005). Engaging by design: How engagement strategies in popular computer and video games can inform instructional design. *Educational Technology Research and Development, 53*(2), 67-83. doi:10.1007/BF02504866

Abstract (quoted from source):

Computer and video games are a prevalent form of entertainment in which the purpose of the design is to engage players. Game designers incorporate a number of strategies and tactics for engaging players in "gameplay." These strategies and tactics may provide instructional designers with new methods for engaging learners. This investigation presents a review of game design strategies and the implications of appropriating these strategies for instructional design. Specifically, this study presents an overview of the trajectory of player positioning or point of view, the role of narrative, and methods of interactive design. A comparison of engagement strategies in popular games and characteristics of engaged learning is also presented to examine how strategies of game design might be integrated into the existing framework of engaged learning.

Gallagher, M., & Holland, P. C. (1994). The amygdala complex: Multiple roles in associative learning and attention. *Proceedings of the National Academy of Sciences, 91*(25), 11771-11776. doi:10.1073/pnas.91.25.11771

Abstract (quoted from source):

Although certain neurophysiological functions of the amygdala complex in learning seem well established, the purpose of this review is to propose that an additional conceptualization of amygdala function is now needed. The research we review provides evidence that a subsystem within the amygdala provides a coordinated regulation of attentional processes. An important aspect of this additional neuropsychology of the amygdala is that it may aid in understanding the importance of connections between the amygdala and other neural systems in information processing.

Lewis, M., Hitchcock, D. F., & Sullivan, M. W. (2004). Physiological and emotional reactivity to learning and frustration. *Infancy, 6*(1), 121-143. doi:10.1207/s15327078in0601_6

Abstract (quoted from source):

This study examined the behavioral (arm, facial) and autonomic (heart rate, respiratory sinus arrhythmia [RSA], and adrenocortical axis) reactivity of 56 4-month-old infants in response to contingency learning and extinction-induced frustration. During learning, infants displayed increases in operant arm response and positive emotional expressions. Changes in average RSA(VNA) paralleled the observed changes in facial expressions in general and maintained an inverse relation with heart rate throughout most of the session. When frustrated by extinction, infants displayed increases in negative expressions, heart rate, and a brief increase in RSA(VNA) followed by a significant decrease. No significant changes were observed for cortisol. These behavioral and facial responses are consistent with earlier work. The physiological changes, along with the facial expressions and instrumental responses, indicate that the autonomic nervous system functions as a coordinated affect system by 4 months of age.

McGaugh, J. L., Cahill, L., & Roozendaal, B. (1996). Involvement of the amygdala in memory storage: Interaction with other brain systems. *Proceedings of the*

National Academy of Sciences, 93(24), 13508-13514.

doi:10.1073/pnas.93.24.13508

Abstract (quoted from source):

There is extensive evidence that the amygdala is involved in affectively influenced memory. The central hypothesis guiding the research reviewed in this paper is that emotional arousal activates the amygdala and that such activation results in the modulation of memory storage occurring in other brain regions. Several lines of evidence support this view. First, the effects of stress-related hormones (epinephrine and glucocorticoids) are mediated by influences involving the amygdala. In rats, lesions of the amygdala and the stria terminalis block the effects of posttraining administration of epinephrine and glucocorticoids on memory. Furthermore, memory is enhanced by posttraining intraamygdala infusions of drugs that activate beta-adrenergic and glucocorticoid receptors. Additionally, infusion of beta-adrenergic blockers into the amygdala blocks the memory-modulating effects of epinephrine and glucocorticoids, as well as those of drugs affecting opiate and GABAergic systems. Second, an intact amygdala is not required for expression of retention. Inactivation of the amygdala prior to retention testing (by posttraining lesions or drug infusions) does not block retention performance. Third, findings of studies using human subjects are consistent with those of animal experiments. beta-Blockers and amygdala lesions attenuate the effects of emotional arousal on memory. Additionally, 3-week recall of emotional material is highly correlated with positronemission tomography activation (cerebral glucose metabolism) of the right amygdala during encoding. These findings provide strong evidence supporting the hypothesis that the amygdala is involved in modulating long-term memory storage.

Pichon, S., de Gelder, B., & Grèzes, J. (2012). Threat prompts defensive brain responses independently of attentional control. *Cerebral Cortex, 22*(2), 274-285. doi:10.1093/cercor/bhr060

Abstract (quoted from source):

Negative emotional signals are known to influence task performance, but so far, investigations have focused on how emotion interacts with perceptual processes by mobilizing attentional resources. The attention-independent effects of negative emotional signals are less well understood. Here, we show that threat signals trigger defensive responses independently of what observers pay attention to. Participants were scanned using functional magnetic resonance imaging while watching short video clips of threatening actions and performed either color or emotion judgments.

Seeing threatening actions interfered with performance in both tasks. Amygdala activation reflected both stimulus and task conditions. In contrast, threat stimuli prompted a constant activity in a network underlying reflexive defensive behavior (periaqueductal gray, hypothalamus, and premotor cortex). Threat stimuli also disrupted ongoing behavior and provoked motor conflict in prefrontal regions during both tasks. The present results are consistent with the view that emotions trigger adaptive action tendencies independently of task settings.

Shackman, A. J., Maxwell, J. S., McMenamin, B. W., Greischar, L. L., & Davidson, R. J. (2011). Stress potentiates early and attenuates late stages of visual processing. *The Journal of Neuroscience, 31*(3), 1156-1161. doi:10.1523/JNEUROSCI.3384-10.2011

Abstract (quoted from source):

Stress can fundamentally alter neural responses to incoming information. Recent research suggests that stress and anxiety shift the balance of attention away from a task-directed mode, governed by prefrontal cortex, to a sensory-vigilance mode, governed by the amygdala and other threat-sensitive regions. A key untested prediction of this framework is that stress exerts dissociable effects on different stages of information processing. This study exploited the temporal resolution afforded by event-related potentials to disentangle the impact of stress on vigilance, indexed by early perceptual activity, from its impact on task-directed cognition, indexed by later postperceptual activity in humans. Results indicated that threat of shock amplified stress, measured using retrospective ratings and concurrent facial electromyography. Stress also double-dissociated early sensory-specific processing from later task-directed processing of emotionally neutral stimuli: stress amplified N1 (184–236 ms) and attenuated P3 (316–488 ms) activity. This demonstrates that stress can have strikingly different consequences at different processing stages. Consistent with recent suggestions, stress amplified earlier extrastriate activity in a manner consistent with vigilance for threat (N1), but disrupted later activity associated with the evaluation of task-relevant information (P3). These results provide a novel basis for understanding how stress can modulate information processing in everyday life and stress-sensitive disorders.

Books

Esquith, R. (2007). *Teach like your hair's on fire: The methods and madness inside room 56.* New York, NY: Viking Press.

Page, R. M., & Page, T. S. (2010). *Promoting health and emotional well-being in your classroom*. Sudbury, MA: Jones and Bartlett Learning.

Sapolsky, R. M. (2004). *Why zebras don't get ulcers: The acclaimed guide to stress, stress-related diseases, and coping - now revised and updated.* New York, NY: Holt Paperbacks.

van den Herik, H. J., Iida, H., & Heinz, E. A. (Eds.). (2003). *Advances in computer games: many games, many challenges* (Vol. 135). New York, NY: Springer.

Articles

Cahill, L. (2003). Similar neural mechanisms for emotion-induced memory impairment and enhancement. *Proceedings of the National Academy of Sciences, 100*(23), 13123-13124. doi:10.1073/pnas.2335833100

Medina, J. (2012, August 2). Brain rules for meetings. *Brain Rules.* [Web log post]. Retrieved from http://brainrules.blogspot.com.

Reynolds, T. M. (2011). Foster children: A hidden group. *International Journal of Business and Social Science, 2*(1), 46-50.

Willis, J. (2012, August 3). Neuroscience insights from video game and drug addiction. *Radical Teaching.*[Web log post]. Retrieved from http://www.psychologytoday.com/blog/radical-teaching/201110/neuroscience-insights-video-game-drug-addiction

Theme 16: Enriched Environments

Levykh, M. G. (2008). The affective establishment and maintenance of Vygotsky's zone of proximal development. *Educational Theory, 58*(1), 83-101. doi:10.1111/j.1741-5446.2007.00277.x

Abstract (quoted from source):

Many recent articles, research papers, and conference presentations about Lev Vygotsky's zone of proximal development (ZPD) emphasize the "extended" version of the ZPD that reflects human emotions and desires. In this essay, Michael G. Levykh expands on the extant literature on the ZPD through developing several new ideas. First, he maintains that there is no need to expand ZPD to include emotions, as its more "conservative" dimensions (cognitive, social, cultural, and historical) already encompass affective features. Second, Levykh emphasizes that an emotionally positive collaboration between teachers and students in a caring and nurturing environment must be created from the outset. Finally, he asserts that culturally developed emotions must mediate successful establishment and maintenance of the ZPD in order to be effective. According to Levykh, Vygotsky's notion that learning can lead development represents a crucial contribution to our understanding of teaching and learning by clearly showing that emotions are vital to human learning and development.

Mantzicopoulos, P. (2005). Conflictual relationships between kindergarten children and their teachers: Associations with child and classroom context variables. *Journal of School Psychology, 43*(5), 425-42. doi:10.1016/j.jsp.2005.09.004

Abstract (quoted from source):

The focus of this study was on kindergarten children's reports of teacher–child relational conflict and the associations of the reported conflict with (a) child characteristics (gender, behavior problems, and academic achievement); (b) the quality of classroom practices (teacher instructional practices, transition-to-school activities, and perceptions of support provided by the school); (c) teachers' perceptions of the classroom and school relational climates; and (d) teachers' perceptions of workload stress. These variables were examined with a group of 103 economically disadvantaged children and their kindergarten teachers in 24 public schools. There was evidence that teacher–child conflict was related to problem

behaviors, teachers' perceptions of workload stress, as well as classroom instructional practices and the classroom/school relational climate.

Scoffham, S., & Barnes, J. (December 12, 2011). Happiness matters: Towards a pedagogy of happiness and well-being, *Curriculum Journal, 22*(4), 535-548. doi:10.1080/09585176.2011.627214

Abstract (quoted from source):

The role of the emotions in learning has long been acknowledged but is often overlooked. This article considers the impact one particular emotion, happiness, has on learning and the school curriculum. Recent reports have drawn attention to the importance of happiness (or the lack of it) by highlighting concerns about childhood well-being. At the same time, there is increasing evidence from psychology and neuroscience to suggest that periods of happiness are linked to personal growth, health and development. When we are happy it seems we are more likely to be receptive to outside stimuli than when we are sad or distressed. Happiness also makes us more disposed to engage in creative endeavour, which is itself another source of fulfillment. Positive psychologists argue that rather than being fixed, happiness, optimism and other positive traits can be learnt. We offer evidence from our own professional experience in teaching to corroborate these claims and to extend the debate about the relevance of affective neuroscience to education. In conclusion, we consider how a focus on happiness might underpin a positive approach to curriculum reform.

van Pragg, H., Kemermann, G., & Gage, F. H., (December 2000). Neural consequences of environmental enrichment. *Nature Reviews Neuroscience, 1*, 191-198. doi:10.1038/35044558

Abstract (quoted from source):

Neuronal plasticity is a central theme of modern neurobiology, from cellular and molecular mechanisms of synapse formation in Drosophila to behavioral recovery from strokes in elderly humans. Although the methods used to measure plastic responses differ, the stimuli required to elicit plasticity are thought to be activity-dependent. In this article, we focus on the neuronal changes that occur in response to complex stimulation by an enriched environment. We emphasize the behavioral and neurobiological consequences of specific elements of enrichment, especially exercise and learning.

Books

Clawson, J. G., & Conner, M. (Eds.). (2004). *Creating a learning culture: Strategy, technology, and practice*. New York, NY: Cambridge University Press.

Diamond, M. (1999). *Magic trees of the mind: How to nurture your child's intelligence, creativity, and healthy emotions from birth through adolescence.* New York, NY: Plume Books.

Jensen, E. (2006). *Enriching the brain: How to maximize every learner's potential.* San Francisco, CA: Jossey-Bass.

Zull, J. E. (2002). *The art of changing the brain: Enriching the practice of teaching by exploring the biology of learning.* Sterling, VA: Stylus Publishing, LLC.

Articles

Earle, H. A. (2003). Building a workplace of choice: Using the work environment to attract and retain top talent, *Journal of Facilities Management*, *2*(3), 244-257. doi:10.1108/14725960410808230

Hebert, E. A. (1998). Design matters: How school environment affects children. *Educational Leadership*, *56*(1), 69-79.

James, D. (2010). A need for humor in online courses. *College Teaching*, *52*(3), 93-120. doi:10.3200/CTCH.52.3.93-120

Kotler, P. (1973-1974, Winter). *Atmospherics* as a *marketing tool. Journal of Retailing, 49(4), 48-64.*

Sutliff, M., Higginson, J., & Allstot, S. (2008). Building a positive learning environment for students: Advice to beginning teachers. *Strategies: A Journal for Physical and Sport Educators, 22*(1), 31-33.

Theme 17: Success

Cooper, J. E., Horn, S., & Strahan, D. B. (2005). "If only they would do their homework:" Promoting self-regulation in high school English classes. *High School Journal, 88*(3), 10-26. doi:10.1353/hsj.2005.0001

Abstract (quoted from source):

This study examined ways that seven high school English teachers attempted to promote higher levels of self-regulation and students' responses to their efforts. Researchers met with teachers once a week for three months to design higher-order reasoning questions for assignments and quizzes, review student responses and plan instructional strategies. They functioned as participant observers in these sessions examined student homework logs, and interviewed students and teachers. Teachers' responses emphasized the value of collaboration and asking higher-order reasoning questions. Although students continued to articulate performance goals that focused on grades and rewards, their responses demonstrated greater awareness of self-regulation and goal setting. Most students were able to use the language of self-regulation to describe relations among goals, effort, and outcomes. Results of this case study suggest that efforts to promote self-regulation more explicitly within the fabric of lessons might be productive, especially if offered for an extended amount of time.

Engin, A. O. (2009). Second language learning success and motivation. *Social Behavior and Personality: An International Journal, 37*(8), 1035-1041. doi:10.2224/sbp.2009.37.8.1035

Abstract (quoted from source):

The aim of this study was to understand the importance of the types of motivation students need to learn a foreign language successfully. Teaching and learning a foreign language are dependent upon positive motivation. A questionnaire and an achievement test were prepared and administered to a group of 44 students. Results *were analyzed and evaluations and comparisons between success and motivation levels were then used to make suggestions for planning activities relating to teaching and learning languages.*

Salomon, G. (1984). Television is "easy" and print is "tough": The differential investment of mental effort in learning as a function of perceptions and attributions. *Journal of Educational Psychology, 76*(4), 647-658. doi:10.1037/0022-0663.76.4.647

Abstract (quoted from source):

Addressed the question of how learners' a priori perceptions of message categories relate to their perceived self-efficacy in handling them, and how perceptions relate to the amount of invested mental effort (AIME) and learning. The AIME was defined as the number of nonautomatic mental elaborations applied to material and measured by learners' self-reports. It was hypothesized that in the absence of instructions, AIME expended in elaborating materials varies as a function of initial perceptions even when the material warrants otherwise. TV and print were considered categories for which children have general perceptions. 124 6th graders were tested for their perceptions of self-efficacy with print and TV, perceived media realism, and attributions of failure and success with each medium. Half the Ss viewed a silent film, while the other half read a comparable text. Measures of AIME and achievement were then taken. As expected, Ss felt more efficacious with TV, and perceived it as more realistic and easy. Print was reported to demand more effort, but led to better inference making. Efficacy correlated positively with AIME in print and negatively in TV. Discussion focuses on the roles of a priori perceptions and AIME in learning

Seifert, T. (2004). Understanding student motivation. *Educational Research, 46*(2), 137-149. doi:10.1080/0013188042000222421

Abstract (quoted from source):

Contemporary theories of academic motivation seek to explain students' behaviours in academic settings. While each theory seems to possess its own constructs and unique explanations, these theories are actually closely tied together. In this theoretical study of motivation, several theories of motivation were described and an underlying theme of the influence of emotions was used to unify the theories. In these theories, emotions and beliefs are thought to elicit different patterns of behaviour such as pursuit of mastery, failure avoidance, learned helplessness and passive *aggression. Implications emerged which focused upon creating classroom contexts that foster feelings of autonomy, competence and meaning as the catalysts for developing adaptive, constructive learning.*

Books

Duhigg, C. (2012). *The power of habit: Why we do what we do, and how to change.* New York, NY: Random House.

Dweck, C. S. (2009). *Mindset, The new psychology of success.* New York, NY: Ballantine Books.

Jensen, E. (2005). *Teaching with the brain in mind* (2nd ed.). Alexandria, VA: Association for Supervision & Curriculum Development.

Mendler, A. N. (2000). *Motivating students who don't care: Successful techniques for educators.* Bloomington, IN: National Educational Service.

Purkey, W. W. & Novak, J. M. (1996). *Inviting school success: A self-concept approach to teaching, learning, and democratic practice* (3rd ed.). Belmont, CA: Wadsworth Publishing.

Articles

Ames, C. (1992). Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology, 84*(3), 261-271. doi:10.1037/0022-0663.84.3.261

Goerg, S. J., Kube, S., & Zultan, R. (2010). Treating equals unequally: Incentives in teams, workers' motivation, and production technology. *Journal of Labor Economics, 28*(4), 747-772. doi:10.1086/653487

Keller, J. M. (1987). Strategies for stimulating the motivation to learn. *Performance and Instruction, 26*(8), 1-7. doi:10.1002/pfi.4160260802

Larkin, M. J. (2001). Providing support for student independence through scaffolded instruction. *Teaching Exceptional Children, 34*(1), 30-34.

Linnenbrink, E. A. & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review, 31*(3), 313-327.

Shuell, T. J. (1988). The role of the student in learning from instruction. *Contemporary Educational Psychology, 13*(3), 276-295. doi:10.1016/0361-476X(88)90027-6

Willis, J. (2010). Inoculate against boredom: The arts in school to prevent dropping out-physically or virtually. *Radical Teaching.* [Web log post]. Retrieved from http://www.psychologytoday.com/blog/radical-teaching/201012/inoculate-against-boredom

Theme 18: Performance Feedback

Bangert-Drowns, R. L., Kulik, C. C., Kulik, J. A., & Morgan, M. T. (1991). The instructional effect of feedback in test-like events. *Review of Educational Research, 61*(2), 213-238. doi:10.3102/00346543061002213

Abstract (quoted from source):

Feedback is an essential construct for many theories of learning and instruction, and an understanding of the conditions for effective feedback should facilitate both theoretical development and instructional practice. In an early review of feedback effects in written instruction, Kulhavy (1977) proposed that feedback's chief instructional significance is to correct errors. This error-correcting action was thought to be a function of presentation timing, response certainty, and whether students could merely copy answers from feedback without having to generate their own. The present meta-analysis reviewed 58 effect sizes from 40 reports. Feedback effects were found to vary with control for presearch availability, type of feedback, use of pretests, and type of instruction and could be quite large under optimal conditions. Mediated intentional feedback for retrieval and application of specific *knowledge appears to stimulate the correction of erroneous responses in situations where its mindful (Salomon & Globerson, 1987) reception is encouraged.*

Ferguson, P. (2011). Student perceptions of quality feedback in teacher education. *Assessment & Evaluation in Higher Education, 36*(1), 51-62. doi:10.1080/02602930903197883

Abstract (quoted from source):

Many reports have identified a perceived lack of quality in regard to assessment feedback in higher education contexts. One research study in 2007 on undergraduate university students found that less than half of the students (46%) collected their formative feedback, suggesting that from their perspective feedback clearly was not fulfilling the role it should. This is a study of 465 graduate students and 101 undergraduate students studying teacher education at a major Australian university. The study investigated what students perceived to be effective, quality feedback based upon their extensive higher education experiences. Students identified preferences in regard to form, detail and timing of assessment feedback. The data were collected by means of pen and paper survey and identified which strategies the students perceived to be the most effective, particularly within the context of large cohort teaching and written assessment formats. Findings agreed with research elsewhere regarding problems with assessment feedback quality and quantity, but students also provided clear indications of how realistic improvements could be made in terms of assessment feedback processes and strategies.

Finn, B., & Metcalfe, J. (2010). Scaffolding feedback to maximize long-term error correction. *Memory & Cognition, 38*(7), 951-961. doi:10.3758/MC.38.7.951

Abstract (quoted from source):

Scaffolded feedback was tested against three other feedback presentation methods (standard corrective feedback, minimal feedback, and answer-until-correct multiple-choice feedback) over both short- and long-term retention intervals in order to assess which method would produce the most robust gains in error correction. Scaffolded feedback was a method designed to take advantage of the benefits of retrieval practice by providing incremental hints until the correct answer could be self-generated. In Experiments 1 and 3, on an immediate test, final memory for the correct answer was lowest for questions given minimal feedback, moderate for the answer-until-correct condition, and equally high in the scaffolded feedback condition and the standard feedback condition. However, tests of the maintenance of the corrections *over a 30-min delay (Experiment 2) and over a 1-day delay (Experiment 3) demonstrated that scaffolded feedback gave rise to the best memory for the correct answers at a delay.*

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 181-112. doi:10.3102/003465430298487

Abstract (quoted from source):

Feedback is one of the most powerful influences on learning and achievement, but this impact can be either positive or negative. Its power is frequently mentioned in articles about learning and teaching, but surprisingly few recent studies have systematically investigated its meaning. This article provides a conceptual analysis of feedback and reviews the evidence related to its impact on learning and achievement. This evidence shows that although feedback is among the major influences, the type of feedback and the way it is given can be differentially effective. A model of feedback is then proposed that identifies the particular properties and circumstances that make it effective, and some typically thorny issues are discussed, including the timing of feedback and the effects of positive and negative feedback. Finally, this analysis is used to suggest ways in which feedback can be used to enhance its effectiveness in classrooms.

Lieberman, D .A., Vogel, A. C., & Nisbet J. (2008). Why do the effects of delaying reinforcement in animals and delaying feedback in humans differ? A working-memory analysis. *Quarterly Journal of Experimental Psychology, 61*(2), 194-202. doi:10.1080/17470210701557506

Abstract (quoted from source):

Animal research has shown that reinforcement is substantially less effective when it is delayed, but in studies of human motor learning delays in providing feedback typically have much less effect. One possible explanation is that in human research participants know the response to be learned and can thus focus on it during the delay; that is not the case in experiments on animals. We tested this hypothesis using a task in which participants had minimal information on what movement was correct and found that, as in animal experiments, participants learned only when feedback was immediate. A second experiment confirmed that the effects of the delay depended on how many responses had to be held in working memory: the greater the memory *load, the poorer the learning. The results point to the importance of activity during a delay on learning; implications for the teaching of motor skills are discussed.*

Books

Brookhart, S. M. (2009). *How to give effective feedback to your students.* Alexandria, VA: Association for Supervision and Curriculum Development.

Chappuis, J. (2009). *Seven strategies of assessment for learning.* Boston, MA: Allyn & Bacon.

Marzano, R. J., Pickering, D., & Pollock, J. E. (2004). *Classroom instruction that works, Research-based strategies for increasing student achievement.* Alexandria, VA: Association for Supervision and Curriculum Development.

Schmidt, R. A., & Lee, T. D. (2007). *Motor control and learning, a behavioral emphasis.* (4th ed.). Champaign, IL: Human Kinetics Publishers.

Weitzel, S. (2000). *Feedback that works; How to build and deliver your message.* Greensboro, NC: Center for Creative Leadership.

Articles

Bowman, Jr., R. F. (1982). A 'Pac-Man' theory of motivation: Tactical implications for classroom instruction. *Educational Technology, 22* (9), 14-16.

The Highland Curriculum for Excellence. (2001). "How am I doing?" - Assessment and feedback to learners. Retrieved from http://www.hvlc.org.uk/ace/aifl/docs/B1/How_am_I_doing.pdf

Lorenzet, S. J., Cook, R. G., & Ozeki, C. (2006). Improving performance in very small firms through effective assessment and feedback, *Education + Training, 48*(8/9), 568-583. doi:10.1108/00400910610710010

Nawaz1, N., Jahanian, A., & Manzoor, S. W. (2012). Critical elements of the constructive performance. *European Journal of Business and Management, 4*(7), 76-84.

Parson, M. (2001, January 1). Enthusiasm and feedback: A winning combination! *PE Central.* Retrieved from http://www.pecentral.org/climate/monicaparsonarticle.html.

Sadler, D. R. (1989). Formative assessment and the design of instructional systems. *Instructional Science, 18*(2), 119-144. doi:10.1007/BF00117714

Theme 19: Stagecraft

Gelula, M. H. (1997). Effective lecture presentation skills. *Surgical Neurology, 47*(2), 201-204. doi:10.1016/S0090-3019(96)00344-8

Abstract (quoted from source):

Lectures are the most popular form of teaching in medical education. As much as preparation and organization are key to the lecture's success, the actual presentation also depends upon the presenter's ability to reach the audience. Teaching is a lively activity. It calls for more than just offering ideas and data to an audience. It calls for direct contact with the audience, effective use of language, capability to use limited time effectively, and the ability to be entertaining. This article offers a structure to effective lecturing by highlighting the importance of voice clarity and speaking speed, approaches to using audiovisual aids, effectively using the audience to the lecture, and ways to be entertaining.

Javidi, M. M., Downs, V. C., & Nussbaum, J. F. (1988). A comparative analysis of teachers' use of dramatic style behaviors at higher and secondary educational levels. *Communication Education, 37*(4), 278-288.

Abstract (quoted from source):

The present investigation provides comparative data on the use of humor, self-disclosure, and narrative by award-winning teachers at college and secondary levels. The frequency in usage of these three dramatic style behaviors by award-winning and non-award winning teachers at these levels is also compared. Significant differences were found between award-winning college and secondary level teachers in their use of humor. Award-winning college and high school teachers did not differ significantly in their use of self-disclosure and narrative during 50-minutes of lecturing. However, both award-winning college and high school teachers significantly differed from award-winning mid-high teachers in use of both self-disclosure and narrative. The results also indicate that the award-winning teachers consistently utilized humor, self-disclosure, and narrative in order to clarify course content, and this usage was significantly higher than the non-award winning teachers from the same educational levels.

Lance, T. S. (2012). Using cultural products to teach onomatope in Japanese as a foreign language (JFL) classrooms. (Master's thesis, California State University, Long Beach, CA). Retrieved from http://hdl.handle.net/10211.4/463

Abstract (quoted from source):

The Japanese language has an abundance of onomatopoeic and mimetic expressions. Native speakers use this unique feature of the language frequently. However, in the reading of Japanese authentic materials, such as literature, newspapers and advertisements, many intermediate to advanced JFL students are unable to understand the meaning of onomatope. The purpose of this project is to provide Japanese as a foreign language (JFL) teachers and students effective and easy-to-use teaching materials focusing on onomatope, presented through the use of authentic cultural products such as literature, music and song, newspapers, and advertisements. Commonly used and highly functional onomatope words, phrases, and expressions are presented with abundant examples of English translations. Useful resources are listed to facilitate selection of materials. This project focuses on

teaching Japanese onomatopoetic and mimetic words in JFL classrooms, using Japanese cultural products. Depicting not only various sounds and voices produced by animated beings and inanimate objects, Japanese onomatopoeias and mimesis also describe "non-audible" situations, such as appearance, scenes, and psychological states of living things, including humans and animals. This type of lexicon is not adequately addressed in JFL classrooms, despite its unique and effective functions (mainly as adverbs), and frequent use in daily life. Japanese onomatope have rich and unique cultural and linguistic elements. By learning onomatope via authentic materials, such as the cultural products introduced in the appendices of this project, JFL learners can more effectively acquire onomotope in a natural way. When JFL students acquire this important linguistic aspect of language, they are able to deepen their understanding of Japanese culture, and develop more native-like, natural expressions and communicative competence.

Nunes, M. A. S., Dihl, L. L., Fraga, L. M., Woszezenki, C. R., Oliveira, L., Francisco, D. J., & Notargiacomo, M. D. G. (2010). Animated pedagogical agent in the intelligent virtual teaching environment. *Digital Education Review, 4*, 53-61.

Abstract (quoted from source):

This paper presents the evolution description and relevance of IVTE- Intelligent Virtual Teaching Environment project in terms of Artificial Intelligence and Artificial Intelligence in Education field. Furthermore, it describes the importance of Multi-agents modeling used in the IVTE software and also gives emphasis in the Cognitive Agent Model represented by an Animated Pedagogical Agent. The purpose of IVTE software is to educate children to preserve the environment. The IVTE software is implemented with Multi-agent (MAS) and Intelligent Tutoring Systems (ITS) technology, which gives more adaptable information to the teaching process. The adaptable information is promoted by Tutor of ITS or, in other words, by Animated Pedagogical Agent. The Animated Pedagogical Agent monitors, guides and individualizes the learning process using student model and teaching strategies.

Pineau, E. L. (1994). Teaching is performance: Reconceptualizing a problematic metaphor. *American Educational Research Journal, 31*(1), 3-25. doi:10.3102/00028312031001003

Abstract (quoted from source):

Analogies between teaching and performance have recently emerged in educational literature, but with a reductive, actor-centered perspective that diminishes the complexity of both performative and instructional phenomena. This article reconceptualizes performance as a generative metaphor for educational research based on theoretical and methodological points of contact between instructional communication and performance studies. It asks which aspects of educational experience open themselves up to performance-centered research and explores issues around which new research agendas can be developed in both disciplines.

Books

Allen, R. (2008). *Green light classrooms: Teaching techniques that accelerate learning*. Thousand Oaks, CA: Corwin Press.

Cohen, R. (2007). *Acting one* (5th ed.). New York, NY: McGraw Hill Education.

Gillard, M. (1996). *Storyteller, storyteacher: Discovering the power of storytelling for teaching and living*. York, ME: Stenhouse Publishers.

Hake, H. V. (1958). *Here's how!: A basic stagecraft book.* New York, NY: Samuel French.

Heppner, F. (2007). *Teaching the large college class: A guidebook for instructors with multitudes*. San Francisco, CA: Jossey-Bass.

Johnson, B., & McElroy, T. M. (2010). *The edutainer: Connecting the art and science of teaching*. Lanham, MD: Rowman & Littlefield Education.

Lowman, J. (1995). *Mastering the techniques of teaching* (2nd ed.). San Francisco, CA: Jossey-Bass.

Ready, T. (2000). *Grammar wars: 179 Games and improvs for learning language arts*. Downers Grove, IL:Meriwether Publisher.

Spolin, V. (1986). *Theater games for the classroom: A teacher's handbook.* Evanston, IL: Northwestern University Press.

Tauber, R. T., & Mester, C. S. (2007). *Acting lessons for teachers: Using performance skills in the classroom* (Vol. 38). Westport, CT: Praeger Publishers.

Timpson, W. M., & Burgoyne, S. (2002). *Teaching & performing ideas for energizing your classes.* Madison, WI: Atwood Publishing.

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Astrachan, O. (1998). Concrete teaching: Hooks and props as instructional technology. *ACM SIGCSE Bulletin, 30*(3), 21-24. doi:10.1145/290320.283003

Dawe, H. A. (1984). Teaching: A performing art. *Phi Delta Kappan, 65*(8), 548-552.

Engvall, C. (2008, July 13). Stage craft: Taking cues from theater class to help make math and science fun. *Edutopia.org.* Retrieved from http://www.edutopia.org/math-science-emotional-impact

Hathaway, P. (n.d.). Using props in presentations. *SpeakerNet News Compilations.* Retrieved from http://www.speakernetnews.com/post/props.html

Renée, C. (2011, July 31). Why language teachers should teach with props. [Web log post]. Retrieved from http://ideasforfrenchclass.blogspot.com/2011/07/why-language-teachers-should-teach-with.html

Rubin, L. (1983). Artistry in teaching. *Educational Leadership, 40*(4), 44-9.

Speaker, S. L. (1995). Getting engaged: Using the time machine to teach history. *The History Teacher, 28*(4), 513-522. doi:10.2307/494639

Travers, R. M. W. (1979). Training the teacher as a performing artist. *Contemporary Education. 51*(1), 14-18.

Theme 20: Complementary Elements

Badger, R., & White, G. (2000). A process genre approach to teaching writing. *ELT Journal, 54*(2), 153-160. doi:10.1093/elt/54.2.153

Abstract (quoted from source):

This paper analyses the strengths and weaknesses of product, process, and genre approaches to writing in terms of their view of writing and how they see the development of writing. It argues that the three approaches are complementary, and identifies an approach which is informed by each of them.

Kirsh, D. (1995, July). Complementary strategies: Why we use our hands when we think. In J. Moore, & J. Lehman (Eds.), *Proceedings of the Seventeenth Annual Conference of the Cognitive Science Society* (pp. 212-217). Mahwah, NJ: Lawrence Erlbaum Associates.

Abstract (quoted from source):

A complementary strategy can be defined as any organizing activity which recruits external elements to reduce cognitive loads. Typical organizing activities include pointing, arranging the position and orientation of nearby objects, writing things down, manipulating counters, rulers or other artifacts that can encode the state of a process or simplify perception. To illustrate the idea of a complementary strategy, a simple experiment was performed in which subjects were asked to determine the dollar value of collections of coins. In the no-hands condition, subjects were not allowed to touch the coin images or to move their hands in any way. In the hands condition, they were allowed to use their hands and fingers however they liked. Significant improvements in time and number of errors were observed when S's used their hands over when they did not. To explain these facts, a brief account of some

commonly observed complementary strategies is presented, and an account of their potential benefits to perception, memory and attention.

Van Merriënboer, J. J., Kester, L., & Paas, F. (2006). Teaching complex rather than simple tasks: Balancing intrinsic and germane load to enhance transfer of learning. *Applied Cognitive Psychology, 20*(3), 343-352. doi:10.1002/acp.1250

Abstract (quoted from source):
Research indicates that effective instructional methods for practicing simple tasks differ from effective methods for complex tasks. But unfortunately, load-reducing methods that work relatively well to reach high retention performance for complex tasks, such as low variability and complete guidance and feedback, are precisely those methods that hinder transfer of learning. This article presents a training design approach aimed at high transfer performance for complex tasks. The basic idea is that learning tasks should always be combined with methods that induce germane cognitive load, such as high variability and limited guidance or feedback. However, especially for novices, this can only be realized by decreasing intrinsic load early in training by manipulating the element interactivity of the learning tasks.

Vare, P., & Scott, W. (2007). Learning for a change: Exploring the relationship between education and sustainable development. *Journal of Education for Sustainable Development, 1*(2), 191-198. doi:10.1177/097340820700100209

Abstract (quoted from source):
Whether we view sustainable development as our greatest challenge or a subversive litany, every phase of education is now being urged to declare its support for education for sustainable development (ESD). In this paper, we explore the ideas behind ESD and, building on work by Foster and by Scott and Gough, we argue that it is necessary now to think of two complementary approaches: ESD 1 and ESD 2. We see ESD 1 as the promotion of informed, skilled behaviours and ways of thinking, useful in the short-term where the need is clearly identified and agreed, and ESD 2 as building capacity to think critically about what experts say and to test ideas, exploring the dilemmas and contradictions inherent in sustainable living. We note the prevalence of ESD 1 approaches, especially from policy makers; this is a concern because people rarely change their behaviour in response to a rational call to do so,

and more importantly, too much successful ESD 1 in isolation would reduce our capacity to manage change ourselves and therefore make us less sustainable. We argue that ESD 2 is a necessary complement to ESD 1, making it meaningful in a learning sense. In this way we avoid an either-or debate in favour of a yes-and approach that constantly challenges us to understand what we are communicating, how we are going about it and, crucially, why we are doing it in the first place.

Wills, S., Ip, A., & Bunnett, A. (2000). Complementary pedagogical strategies for online design. In R. Sims, M. O'Reilly, & S. Sawkins (Eds.), Learning to choose - Choosing to learning. *Proceedings of the 17th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE)* (pp. 405-414). Lismore, NSW Australia: Southern Cross University Press.

Abstract (quoted from source):

The First Fleet Convict Database has had a 20 year journey as an exemplar of educational software, published first on mainframe, then microcomputer, and now the web. We describe how the nature of the web environment has changed the nature of this educational package. Pedagogically, databases of primary source data provide students with a learning experience based on the inquiry learning model however, observations of students and teachers in the past 20 years have indicated that database searching is shallow and investigation perfunctory. Before, we could have blamed unwieldy search engines. Now that this obstacle appears to have been removed, we are evaluating whether we have achieved our educational goal of improving students' research skills. Other pedagogical strategies have been added to that of the database strategy, for example a discussion forum to enable learners to publish and debate their opinions on history. However our statistics show that the forum is the least used part of the site. Although this in part can be solved via classroom teaching, we have added another pedagogical strategy to complement the others. Online role play engages students in developing an understanding of the lives of others and hopefully encourages discussion about the content of the supporting database.

Books

Bahuchet, S., Hladik, C. M., Hladik, A., & Dounias, E. (1990). Agricultural strategies as complementary activities to hunting and fishing. In *Food and Nutrition in the African Rain Forest* (pp.31-34). Paris, France: UNESCO.

Bell, S. (2004). *Elements of visual design in the landscape.* New York, NY: Routledge.

Carlson, J. S., & Levin, J. R. (2011). *Instructional strategies for improving students' learning: Focus on early reading and mathematics.* Charlotte, NC: Information Age Publishing.

Cole, R. W. (2001). *More strategies for educating everybody's children.* Alexandria, VA: Association for Supervision and Curriculum Development.

Itten, J. (1970). *The elements of color* (Vol. 4). New York, NY: John Wiley & Sons

Kelso, J. A. S., & Engstrøm, D. A. (2006). *The complementary nature.* Cambridge, MA: MIT Press.

Lewith, G. T, Jonas, W. B., & Walach, H. (Eds.). (2003). *Clinical research in complementary therapies* (2nd ed.). Amsterdam, The Netherlands: Churchill Livingston Elsevier.

Silver, H. F., Strong, R. W., & Perini, M. J. (2007). *The strategic teacher: Selecting the right research-based strategy for every lesson.* Alexandria, VA: Association for Supervision and Curriculum Development.

Articles

Delbanco, T. L. (1992). Enriching the doctor-patient relationship by inviting the patient's perspective. *Annals of internal medicine, 116*(5), 414-418.

Doczi, G. (1986). Seen and unseen symmetries: A picture essay. *Computers & Mathematics with Applications, 12(*1), 39-62. doi:10.1016/0898-1221(86)90138-0

Lipton, P. A., & Eichenbaum, H. (2008). Complementary roles of hippocampus and medial entorhinal cortex in episodic memory. *Neural Plasticity, 2008*, 1-8. doi:10.1155/2008/258467

Purao, S. (1998). Hyper-link teaching and intelligent slides: Complementary strategies to foster active learning. *Journal of Education for MIS, 5*(1), 63-78.

Wei-Ming, W. (n.d.).*Yin Yang and Dao.* Retrieved from http://www.butte.edu/~wmwu/Shared%20Thoughts/Yin%Yang%20and %20Dao.html

Theme 21: Time and Timing

Frijda, N. H. (1987). Emotion, cognitive structure, and action tendency. *Cognition and Emotion, 1*(2), 115-143. doi:10.1080/02699938708408043

Abstract (quoted from source):

In current cognitive emotion theory emotional experiences are described as particular types of cognitive structures. Two studies are reported that test an implication of this theory, namely, the prediction that intuitive similarity of emotion or mood states corresponds with similarity between such structures. Cognitive structures of different emotions ("appraisal profiles") were obtained by having subjects rate a number of emotions or mood words as to presence of a number of appraisal components. Intuitive similarity measures consisted of correlations between mood adjective questionnaire items and (in Study 2) outcomes of a word sorting task. High correspondence was found between appraisal profile similarities and intuitive

similarities. Exploratory analyses confirmed the importance of several appraisal components discussed in the literature and provided tentative evidence for some additional ones. In a third study, the hypothesis was explored that cognitive structures of emotions also include representations of action readiness. Subjects were presented with 30 of the emotion words used in Study 2. Remembered or imagined experiences of each of the emotions were rated in terms of 16 modes of action readiness. High agreement was obtained in assigning action readiness modes to emotions. Strong correlations existed between particular appraisal patterns and particular forms of action readiness. Similarity in action readiness profiles showed correspondence with appraisal pattern similarity and with the indices of intuitive similarity.

Madsen, C. K., Standley, J. M., & Cassidy, J. W. (1989). Demonstration and recognition of high and low contrasts in teacher intensity. *Journal of Research in Music Education, 37*(2), 85-92. doi:10.2307/3344700

Abstract (quoted from source):

The purpose of this study was to investigate teacher intensity, the global attributes of enthusiasm combined with an astute sense of timing in relation to classroom management and effective subject presentation and delivery. The authors also tried to ascertain whether high and low contrasts in teacher intensity could be taught to and then demonstrated by prospective music education student teachers (n = 20) and whether other music education majors untrained in the concept of intensity could recognize these contrasts (freshmen, n = 23; seniors, n = 22; and graduate students, n = 29). Results of the study indicated that intensity as a concept could be operationally defined, easily taught to prospective student teachers, ably demonstrated, and recognized with an extremely high degree of reliability across levels of sophistication within the music education major.

Sanford, J. P., & Evertson, C. M. (1983). Time use and activities in junior high classes. *The Journal of Educational Research, 76*(3), 140-147.

Abstract (quoted from source):

Time use in different activities in junior high school is described, and relationships between class time use and student achievement, behavior and attitude are examined. A total of 102 English and mathematics classes were observed for about 9 hours each. Data included descriptive narratives, time logs, student engagement ratings and observer ratings of student and teacher behavior. Results showed that there is

much variation in the way individual junior high school teachers use class time, within a limited number of activity structures. Significant relationships were found between time use and class achievement and attitude in mathematics classes, but not in English classes.

Tong, A. K. Y. (2001). Linking and timing information presentation in multimedia educational systems. *Journal of Educational Multimedia and Hypermedia, 10*(2), 185-203

Abstract (quoted from source):

Linking and timing what is to be presented to the learner is particularly important in multimedia educational environments, especially when the same piece of material can be presented to the learner in different media, often more than once. This article addresses the linking and timing attributes of the presentation of learning material in multimedia educational systems by way of a control in teaching strategy selection. The control mechanism is illustrated through the model for teaching strategy selection. The model is based on factors that affect human teachers in their teaching strategy selection, which in turn governs the decision of which piece of material to present, and the timeliness of such. The benefits of the model are demonstrated through ARISTOTLE, a multimedia education system in which the model is deployed.

Books:

Allen, S. R. (2007). *Predicting performance in sport using a portable cognitive assessment device.* Boston, MA: Boston University.

Dale Carnegie Training. (2011). *Stand and deliver: How to become a masterful communicator and public speaker.* London, UK: Simon and Schuster

Gordon, B. (2005). *Business and sales humor writing and delivery skills guidebook.* Los Angeles, CA: University of Health Care.

Jensen, E. (Ed.). (2008). *Super teaching: Over 1000 practical strategies.* Thousand Oaks, CA: Corwin Press.

Kelly, L. E., Kelly, L., & Melograno, V. (2004). *Developing the physical education curriculum: An achievement-based approach.* Champaign, IL: Human Kinetics Publishers.

Russell, J., & Russell, L. (2006). *Change basics.* Alexandria, VA: American Society for Training and Development.

Sharma, P. L. (2006). *Learning readiness.* New Delhi, India: Sarup & Sons

Smith, T. E., & Knapp, C. E. (Eds.). (2011). *Sourcebook of experiential education: Key thinkers and their contributions.* Taylor & Francis e-Library.

Articles

Arlin, M., & Westbury, I. (1976). The leveling effect of teacher pacing on science content mastery. *Journal of Research in Science Teaching, 13*(3), 213-219. doi:10.1002/tea.3660130304

Barr, R. (1975). How children are taught to read: Grouping and pacing. *The School Review, 83*(3), 479-498.

Gerner, M. (1981). The brain and behavior: Casting light into the" black-box". *Psychological Reports, 49*(2), 511-518. doi:10.2466/pr0.1981.49.2.511

Gundersen, G., & Williams, J. M. (1998). Rehearsal pacing of expert middle school, high school, and university choral and instrumental conductors. *Texas Music Educators Association*, 33-38.

Horn, B. J. (1990). Facilitating self care practices in the elderly. *Home Health Care Services Quarterly, 11*(1-2), 1-8.

Milani, M. (n.d.). *Slow and fast dogs: The canine sense of time.* Retrieved from http://www.mmilani.com/canine-timing.html

Morrison, J. E., & Fletcher, J. D. (2002). *Cognitive readiness* (No. IDA-P-3735). Alexandria, VA: Institute for Defense Analyses. Retrieved from Defense Technical Information Center http://www.dtic.mil/cgi-bin/GetTRDoc?Location=U2&doc=GetTRDoc.pdf&AD =ADA417618

Vacca, R. T. (1977). Readiness to read content area assignments. *Journal of Reading, 20*(5) 387-392.

Theme 22: Personal Presence

Beebe, S. A. (1980, November). *The role of nonverbal communication in education: Research and theoretical perspectives.* Paper presented at the Annual Meeting of the Speech Communication Association, New York, NY.

Abstract (quoted from source):

This paper reviews several studies that have sought to explain the role of nonverbal communication in education contexts. The specific areas that are explored include kinesics, eye contact, paralanguage, classroom environment, proxemics, and physical appearance. After reviewing research in these areas, the paper examines the research conclusions both in general and for each area. One of the conclusions presented is that teacher education programs should not ignore the impact of teacher-controlled nonverbal communication variables in affecting student achievement and student attitudes toward learning.

Hart, R. (2007). *Act like a teacher: Teaching as a performing art.* Available from ProQuest Dissertation and Theses database. (UMI No. AAT 3275803)

Abstract (quoted from source):

This study involved the creation and implementation of an acting course for educators, entitled Teaching as a Performing Art. The primary objective of this

course was to aid the course participants in their role development by providing them the space and technical support (through arts training) to experiment with different ways of being in the classroom. The nine participants in this experiential learning course performed the work of the actor/performing artist and developed the articulate voices and bodies critical for communication and presentation in the classroom arena. Simultaneously the participants practiced using the new skills to consciously shape and rehearse their emerging teacher selves, the roles they would play when they enter the practicum classroom as a teacher. Additional data was collected on two of the participants as they completed their student teaching practica the following semester. Results indicate that new teachers have several performance obstacles to overcome in the creation of efficient and effective teacher roles including: indecision, terror, assumption, embarrassment, denial, extremism and ennui. The findings catalog a number of arts-based activities that enable new teachers to move toward improved ways of being in the classroom by embodying strategy, courage, awareness, presence, honesty, poise and excellence.

Meijer, P. C., Korthagen, F. A .J., & Vasalos, A. (2009). Supporting presence in teacher education: The connection between the personal and professional aspects of teaching. *Teaching and Teacher Education, 25*, 297-308.

Abstract (quoted from source):

This study follows one individual student teacher during a period of one single school year in which she was supported in developing 'presence' while teaching. The notion of 'presence' was formulated by the teacher herself, and coincides with the growing interest in this aspect in psychology, and in theories about becoming a teacher. In her supervision, the so-called core reflection approach was used, which strongly builds on the concept of presence and on positive psychology. Based on analyses of audio taped supervisory sessions, six stages were identified in the teacher's development. These stages are described and related to theories about positive psychology and core reflection. The supervisor's interventions leading to the transitions between the stages were identified, analyzed, and related to key principles of core reflection. It appeared that the teacher's growth not only led to experiencing 'presence' while teaching, but also to a greater use of her personal qualities. Taken together, it appeared that after the supervision the teacher was much more 'in flow', and that she was more effective as a teacher. In this article, both the teacher's growth and the supervisor's interventions are described in detail, and illustrated using quotations from supervisory sessions, logbooks, and interviews. A case is made for connecting professional and personal aspects in supervising student teachers.

Özmen, K. S. (2010). Acting and teacher education: being model for identity development. *Turkish Online Journal of Qualitative Inquiry, 2*(2). 36-49.

Abstract (quoted from source):

This study follows three pre-service teachers during three academic semesters in which they took an acting course for teachers and participated in practicum with a special focus on rehearsing and developing their teacher identities. In order to create the necessary context for them, an acting course for pre-service teacher education was designed in parallel with a model which is based on an influential acting theory. This model, namely the BEING (Believe, Experiment, Invent, Navigate, Generate), was also designed by the researcher. The incentive behind designing a model grounded on acting literature was that the relevant literature does not provide trainers with a universal model which can be referred as a manual for running and monitoring acting courses for teachers. In this case study, this model was also tested in terms of its applicability and functionality in practice. Based on analyses of audio taped interviews, session journals and reflections, the five stages of the BEING Model was found to be highly applicable and functional in terms of reflecting the natural development process of teacher identity development. Pre-service teachers displayed a significant development in communication skills and professional identities. Therefore, the BEING model provides a perspective and a philosophy of benefiting from acting literature for teacher educators with little or no knowledge on acting and theatre.

Tartwijk, J. V., Brekelmans, M., Wubbels, T., Fisher, D. L., & Fraser, B. J. (1998). Students' perceptions of teacher interpersonal style: The front of the classroom as the teacher's stage. *Teaching and Teacher Education, 14*(6), 607-617.

Abstract (quoted from source):

In previous research, associations were shown between students' perceptions of teacher interpersonal style and variables such as student outcomes and problems with order in the classroom. In the study described in this paper, associations are investigated between these students' perceptions and judges' ratings of the interpersonal aspect of videotaped teacher behaviour. Judges only saw one minute of videotaped teacher behaviour during either whole class teaching or individual seatwork. Strong correlations were established between students' perceptions and judges' ratings of teacher behaviour during whole class teaching. No significant *correlations were found between students' perceptions and judges' ratings of teacher behaviour during individual seatwork. It is argued that students' perceptions of teacher interpersonal style are primarily formed when the teacher is in front of the classroom. At those moments a working climate is created that lasts for the whole lesson and beyond.*

Books

Booher, D. (2011). *Creating personal presence: Look, talk, think, and act like a leader*. San Francisco, CA: Berrett-Koehler Publishers.

Esquith, R. (2007). *Teach like your hair's on fire: The methods and madness inside room 56*. New York, NY: Viking Press.

Fairhurst, A. M., & Fairhurst, L. L. (1995). *Effective teaching, effective learning: Making the personality connection in your classroom*. Palo Alto, CA: Davies-Black Publishing.

Fried, R. L. (2001). *The passionate teacher: A practical guide*. Boston, MA: Beacon Press.

Grasha, A. F. (1996). *Teaching with style: A practical guide to enhancing learning by understanding teaching and learning styles*. Pittsburgh, PA: Alliance Publishers.

Gruwell, E. (2007). *Teach with your heart: Lessons I learned from the freedom writers*. New York: Crown Publishing Group.

Littauer, F. (1992). *Personality plus*. Grand Rapids, MI: Revell.

Parini, J. (2005). *The art of teaching*. New York, NY: Oxford University Press.

Rodgers, C., & Scott, K. (2008). The development of the personal self and professional identity in learning to teach. In M. Cochran-Smith, S. Feiman-Nemser, D. J. McIntyre, & K. E. Demers (Eds.), *Handbook of research on teacher education: Enduring questions and changing contexts* (pp. 732–755). New York, NY: Routledge.

Sjodin, T. L. (2001). *New sales speak: The 9 biggest sales presentation mistakes & how to avoid them.* New York, NY: Wiley.

Stanislavski, C. (1989). *An actor prepares* (E.R. Hapgood, Trans.). New York, NY: Routledge.

Articles

Banner Jr., J. M., & Cannon, H. C. (1997). The personal qualities of teaching what teachers do cannot be distinguished from who they are. *Change: The Magazine of Higher Learning, 29*(6), 40-43. doi:10.1080/00091389709602345

Bernstein-Yamashiro, B. (2004). Learning relationships: Teacher-student connections, learning, and identity in high school. *New Directions for Youth Development, 2004*(103), 55-70. doi:10.1002/yd.91

Bilgrave, D. P., & Deluty, R. H. (2004). Stanislavski's acting method and control theory: Vommonalities across time, place, and field. *Social Behavior & Personality: An International Journal. 32*(4), 329-340.

Brigham, F. J., Scruggs, T. E., & Mastropieri, M. A. (1992). Teacher enthusiasm in learning disabilities classrooms: Effects on learning and behavior. *Learning Disabilities Research and Practice, 7*, 68-73.

Fox, A., & Schaefer, C. (1995). Undergraduate students' perceptions of an academic climate for caring. *Psychological Reports, 6*(3c), 1283-1287. doi:10.2466/pr0.1995.76.3c.1283

Griggs, T. (2001). Teaching as acting: Considering acting as epistemology and its use in teaching and teacher preparation. *Teacher Education Quarterly, 28*(2), 23-37.

Nias, J. (1987). Teaching and the self. *Cambridge Journal of Education, 17*(3), 178-185. doi:10.1080/0305764870170313

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Theme 23: Delight

Hamann, S. B., Ely, T. D., Grafton, S. T., & Kilts, C. D. (1999). Amygdala activity related to enhanced memory for pleasant and aversive stimuli. *Nature Neuroscience, 2*(3), 289-293. doi:10.1038/6404

Abstract (quoted from source):

Pleasant or aversive events are better remembered than neutral events. Emotional enhancement of episodic memory has been linked to the amygdala in animal and neuropsychological studies. Using positron emission tomography, we show that bilateral amygdala activity during memory encoding is correlated with enhanced episodic recognition memory for both pleasant and aversive visual stimuli relative to neutral stimuli, and that this relationship is specific to emotional stimuli. Furthermore, data suggest that the amygdala enhances episodic memory in part through modulation of hippocampal activity. The human amygdala seems to modulate *the strength of conscious memory for events according to emotional importance, regardless of whether the emotion is pleasant or aversive.*

Jordan, P. W. (1998). Human factors for pleasure in product use. *Applied Ergonomics, 29*(1), 25-33. doi:10.1016/S0003-6870(97)00022-7

Abstract (quoted from source):

Traditionally, human factors have tended to concentrate on making products 'usable'—focusing on utilitarian, functional product benefits. This paper reports an interview-based study looking at the issue of 'pleasure' in product use. The study was a 'first pass' at addressing the hedonic and experiential benefits and penalties associated with product use, and at identifying the properties of a product that influence how pleasurable or displeasurable it is to use. Feelings associated with using pleasurable products included security, confidence, pride, excitement and satisfaction. Displeasurable products, meanwhile, were associated with feelings that included annoyance, anxiety, contempt and frustration. The properties of products that were salient in terms of influencing the level of pleasure/displeasure with a product included features, usability, aesthetics, performance and reliability. Responses to questions investigating behavioural correlates to pleasure in product use suggested that pleasurable products were used more regularly and that future purchase choices would be affected by the level of pleasure in product use. It is concluded that the issue of pleasure in product use involves more than usability alone. As the user's representative in the product creation process, the human factors specialist should consider many other factors in order to ensure that the user's experience of product use is maximized.

Kirchhoff, B. A., Wagner, A. D., Maril, A., & Stern, C. E. (2000). Prefrontal–temporal circuitry for episodic encoding and subsequent memory. *The Journal of Neuroscience, 20*(16), 6173-6180.

Abstract (quoted from source):

Humans encounter and form memories for multiple types of experiences that differ in content, novelty, and memorability. Critical for understanding memory is determining (1) how the brain supports the encoding of events with differing content and (2) whether neural regions that are sensitive to novelty also influence whether stimuli will be subsequently remembered. This event-related functional magnetic resonance imaging (fMRI) study crossed content (picture/word), novelty (novel/repeated), and subsequent memory (remembered/forgotten) to examine prefrontal and temporal lobe

contributions to encoding. Results revealed three patterns of encoding-related activation in anatomically connected inferior prefrontal and lateral temporal structures that appeared to vary depending on whether visuospatial/visuo-object, phonological/lexical, or semantic attributes were processed. Event content also modulated medial temporal lobe activity; word encoding predominately activated the left hemisphere, whereas picture encoding activated both hemispheres. Critically, in prefrontal and temporal regions that were modulated by novelty, the magnitude of encoding activation also predicted whether an event would be subsequently remembered. These results suggest that (1) regions that demonstrate a sensitivity to novelty may actively support encoding processes that impact subsequent explicit memory and (2) multiple content-dependent prefrontal–temporal circuits support event encoding. The similarities between prefrontal and lateral temporal encoding responses raise the possibility that prefrontal modulation of posterior cortical representations is central to encoding.

Lepper, M. R., & Cordova, D. I. (1992). A desire to be taught: Instructional consequences of intrinsic motivation. *Motivation and Emotion, 16*(3), 187-208. doi:10.1007/BF00991651

Abstract (quoted from source):
This paper summarizes the results from a series of studies designed to test the hypothesis that making learning more fun will produce corresponding increases both in learning and retention and in subsequent interest in the subject matter itself. Each study examined the effects of two or more versions of an educational activity, each designed to involve identical instructional content, but to differ in motivational appeal. The data from the studies presented provide good general support for the hypothesized cognitive and motivational benefits of appropriately designed motivational embellishments of educational activities. Exceptions to this rule, however, and a more general theoretical analysis of the conditions under which such positive effects are (and are not) expected to occur, are also discussed.

Ludden, G. D., Schifferstein, H. N., & Hekkert, P. (2007). Surprising the senses. *The Senses and Society, 2*(3), 353-359.

Abstract (quoted from source):
We perceive the world around us and the objects in it with all our senses. Designers can therefore influence the way we experience everyday products by paying attention to the multiple sensory aspects of products. When sensory information from two or

more senses conflicts, people can be surprised. Currently, more and more product designers are experimenting with designing products that provide incongruent sensory information. Creating such products enables these designers to evoke interest for their products and let people experience something new. In several studies, we have investigated people's reactions to and opinions about products with sensory incongruities. The results of our studies suggest that evoking surprise by incorporating sensory incongruities in products can be seen as a means to create more pleasurable product experiences.

Madrigal, R., Bee, C., Chen, J., & LaBarge, M. (2011). The effect of suspense on enjoyment following a desirable outcome: The mediating role of relief. *Media Psychology, 14*(3), 259-288. doi:10.1080/15213269.2011.596469

Abstract (quoted from source):

Although endemic to many forms of media entertainment, suspense represents a paradox for enjoyment because it is experienced as an aversive state. Three studies are presented across two media contexts demonstrating how outcomes to suspenseful episodes affect viewers' relief. Study 1 shows that relief is elicited only when a film's outcome is unambiguously favorable and under such conditions is positively related to enjoyment. No such relationship was found given an ambiguous outcome. Study 1 provides evidence that relief is distinct from other affective responses (i.e., positive and negative affect, surprise) that may be present following suspense. Studies 2 and 3 use competitive contests as a context and provide evidence that relief mediates the effect of suspense on enjoyment. Study 2 shows that the previously positive effects of suspense and expectation disconfirmation on enjoyment are obviated in the presence of relief. Study 3 varies suspense in real time across 14 simulated races. Also manipulated are affective dispositions toward the racers and race outcome. The results reveal that relief mediates the effect of suspense on enjoyment, but only when the outcome favors a preferred competitor. The research enhances our understanding of the intertwining of cognition and affect in the enjoyment of suspense.

Nagengast, S. L., Baun, M. M., Megel, M., & Michael Leibowitz, J. (1997). The effects of the presence of a companion animal on physiological arousal and behavioral distress in children during a physical examination. *Journal of Pediatric Nursing, 12*(6), 323-330.

Abstract (quoted from source):

The purpose of this study was to examine the effects of the presence of a companion animal on physiological arousal and behavioral distress exhibited by preschool children during a routine physical examination. A within-subject, time-series design was used to study 23 healthy children ages 3 years to 6 years during two physical examinations, with and without a dog. Statistically significant differences were found with greater reductions in subjects' systolic and mean arterial pressure, heart rate, and behavioral distress when the dog was present. Findings support the use of a companion animal in reducing stress experienced by children during a physical examination.

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Puca, M., & Schmalt, H. (1999). Task enjoyment: A mediator between achievement motives and performance. *Motivation and Emotion, 23*(1), 15-29.

Radder, L. (1998) Stakeholder delight: The next step in TQM. *The TQM Magazine, 10*(4), 276-280 doi:10.1108/09544789810222630.

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PROFESSIONAL EXPERIENCES

1980 - 1984	Teacher Cumberland County Schools Fayetteville, NC
1985 - 1993	School Administrator Cumberland County Schools Fayetteville, NC
1993 -1998	Executive Director Mayerson Academy for Human Resource Development Cincinnati, OH
1998 – Present	President Rutherford Learning Group, Inc. Waxhaw, NC

PUBLICATIONS

Creating the Learning Centered Centered School Video Series (2001).

Creating the LearningCentered School Teacher Workbook (2001).

Requisites of a Leader Executive Leadershhip Academy (2005).

Requisites of a Leader Emerging Leadership Academy (2005).

LeaderNext Video Series (2005).

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Skillful Observation and Coaching Laboratory- Lab Notes (2009).

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