ENGAGING STUDENTS TO THINK CREATIVELY:
AN INSIGHT EXERCISE FOR EDUCATORS
IN THE INFORMATION AGE

Robert DeMichiell
Richard Manning
Nova Southeastern University
FORT LAUDERDALE, FLORIDA, U.S.A.
Thomas Griffith
Tunxis Community-Technical College
FARMINGTON, CONNECTICUT, U.S.A.
Amelia Klein
Wheelock College
BOSTON, MASSACHUSETTS, U.S.A.

Abstract

Creativity is an elusive word. Creative educational methods are equally elusive. James Adams of Stanford University, in his 1986 text on Conceptual Blockbusting, concluded that “for most of us, creativity is more of a dull glow than a divine spark. And the more fanning it receives, the brighter it will burn.” This remark suggests that educators must find a way to engage the students into the active learning mode, rather than allow them to be passive listeners who just record, comprehend, and repeat facts. This article examines a methodology to exploit that general concept and focuses primarily on insights to be gained by students who are engaged actively in class discussion.

An illustrative case study, eMatchmaker, was developed by the authors and has been used extensively in graduate classes for several years and has proven to be a very suitable fan for that dull glow. Students have responded to their transformation from listener to active participant in some part because of the nature of the case study itself. Finding a suitable partner for life makes for both enjoyable and informative discussion, is complex enough to test initial assumptions, constraints, and solution designs, and has potential value to the world of business if marketed properly. In addition, students are forced to move back and forth between divergent and convergent thinking as they formulate a solution to the “matching” process. Some comparisons between traditional and active learning, as well as the use of humor in fostering the creative process, highlight creative learning concepts.

Since eCommerce is so pervasive today and will continue into the century, some emphasis is placed on internet implications and other non-technical issues, although the case study has an information technology starting point. The presentation does not assume any knowledge of IT and focuses on the learning aspect of the process almost exclusively.

KEY WORDS: Creativity in the Information Age, Creative Learning, Active Learning Immersion, Humor-based Teaching Strategies, Internet Implications for Creative Approaches, End User Awareness of Software Quality
CREATING A CREATIVE LEARNING ENVIRONMENT

ENGAGING THE STUDENT

If the teacher cannot get the attention of the student and allow information to be received, processed, stored, and applied to new life experiences, then one has to rely on the student to collect these thoughts, concepts, and discussions at another time. Another time may not occur. An opportunity for learning may have been lost. This paper focuses on some “engagement” techniques to get attention and retain it through the use of highly interactive and active discussion of the underlying concepts of some topic of any discipline. The approach here is to use information technology analysis design as the topic, but only to illustrate the technique. In order for customers of automation to be selective, informed, understanding, questioning, and cautious in the use of information technology, including applications programs and/or the internet, their insights are important in the appropriate use of that technology. Many of today’s business managers say that the most important attribute in need of improvement is engaging people in strategy and vision. For strategy and vision, one needs to be engaged followed by a mind set which includes both strategic thinking and vision as components.

FIGURE 1 - ENGAGING STUDENTS

If you can measure it, you can manage it. Thinking style is difficult to measure, but it is possible to engage faculty and students in the concept though one of many instruments [LSI, HBDI, DSS]. Even if the instrument may indicate a preferred style, measured through responses of a questionnaire, and may change depending on the situation encountered, it can provide a framework for discussion of not only how one thinks, but also how a “team” of project members may think, collectively and individually. The major thrust here is to use some instrument, such as the Herrmann Brain Dominance Instrument (HBDI) to examine the four thinking modes (analysis, process, people, and strategy) and use it in a confidential way to highlight the need to find solutions which exercise all four dimensions [Herrmann, 1996]. Since it is likely that most individuals prefer to think in one or two dimensions most of the time, teachers must stretch their own mindset to include more holistic thinking and must require students to do so.
For this paper, we have decided to include our teaching comments and notes directly within the text rather than an added segment at the end. The article is quite long and we think that it will enhance continuity for the reader to examine our comments on approach, design, and delivery of the case study as the program is explained. Again, this example of a computer-based application for finding one’s mate in life (eMatchmaker) is defined only in conceptual terms.

HAVING FUN AND LEARNING AT THE SAME TIME

Humor is usually not taken seriously in academic settings, and only recently has been given significant attention by researchers, psychologists, and educators. Previously considered “unscholarly,” distracting, unprofessional, or even frivolous, humor is now being recognized as a powerful force in the classroom [Shade, 1996]. Educators who teach with humor have discovered that it can influence the classroom climate, have a positive effect on teaching, and transform students’ dispositions toward learning.

NATURE AND STRUCTURE OF HUMOR

Humor has been described as a complex “cognitive, emotional, psychological and physiological phenomenon” [Robinson, 1991]. In the eMatchmaker case study, humor played a key role in arousing students’ curiosity and engaging them in the process of playful, innovative, and creative thinking. How can adult learners have fun and learn at the same time? An examination of humor reveals its complex nature and its potential as an effective teaching tool in the classroom.

Humor has many dimensions. First of all, humor requires cognitive processing. In hearing a joke, interpreting a cartoon, or encountering some other form of humor, the recipient of humor must process information embedded in the humor stimulus. This is because humor is typically based on comic incongruity and resolution. Here is an example:

Reporter: “Do you believe in clubs for teenagers?”
W.C. Fields: “Only if kindness fails!”

To “get” the intended humor, one must figure out what the joke is about and resolve the incongruous elements in the context of the joke. The source of incongruity in the previous joke stems from the double meaning of “clubs.” If a joke also appeals to one’s sense of humor, a mirth response follows. Humor appreciation, therefore, is dependent upon humor comprehension.

Humor has social and emotional value. Only humans experience humor, and most humans enjoy it in the presence of others. When humor is a shared experience, it can create a sense of community and bonding within a group. Shade [1996] draws upon research in highlighting (see Figure 2) the benefits of humor in the classroom when used appropriately.

As a teaching strategy, humor can promote risk-taking by encouraging students to tackle difficult or even threatening subject matter in a low-risk situation. Students are intrinsically motivated to learn, and creative teachers can capitalize on its varied benefits.

Instead of detracting from the educational experience, instructional humor seems to enhance the teaching and learning process. Appropriate and frequent classroom laughter may serve to promote the retention of academic material, reduce academic anxiety in learning and test situations, liberate thinking, and perhaps most importantly, increase learner satisfaction with the entire experience. [Shade, 1996, p. 108]
FIGURE 2 - FACULTY MAY HAVE TO TAKE RISKS

Instead of detracting from the educational experience, instructional humor seems to enhance the teaching and learning process. Appropriate and frequent classroom laughter may serve to:

- promote the retention of academic material,
- reduce academic anxiety in learning and testing situations,
- liberate thinking, and
- perhaps, most importantly,
- increase learner satisfaction with the entire experience.”

Shade, 1996

For students to take risks, faculty may have to do the same…. adapt instructional approach….. using humor.

Finally, humor is healthy! It contributes to one’s well-being because laughter has positive physiological and biochemical effects on the human body. Recent studies have examined the effects of humor and laughter in relation to muscle tension, the nervous system, respiratory activity, and immune and cardiovascular systems [Robinson, 1991]. Research suggests that laughter and the positive emotions associated with humor have a beneficial effect on the body and one’s health. In a classroom environment, humor has the potential to reduce stress and promote a relaxed state of mind – an ideal condition for creative thinking.

HUMOR AND CREATIVITY: HOW ARE THEY RELATED?

Many tests designed to measure creativity have focused on elements such as fluency of thinking, flexibility, originality, and elaboration. For some theorists, divergent thinking is synonymous with creativity. Scholars have pointed out that incongruity is an essential element of humorous and creative thinking processes [McGhee, 1979; Rishel, 2002]. To create comic incongruity or to engage in the process of resolving comic incongruity requires innovative, divergent thinking. Likewise, engaging in creative thinking requires that one look at things from different and unusual angles, and to think “outside of the box.”

When used effectively in the classroom, humor acts as a catalyst for creative thinking. Reviews of the research [Roeckelein, 2002] provide evidence that humor and creativity are significantly related in that:

- humor is a facilitator of the creative process
- wit and creativity are positively correlated
- humor can be an efficient tool to use in developing creative thinking

Other variables present while engaging in the process of humor and creative thinking are (1) a positive, playful disposition (i.e., “cognitive playfulness”) [Ziv, 1989] and, (2) ideational fluency. Ideation refers to the generation of ideas. Professors who have made humor an integral part of their teaching exclaim:

“I use humor continuously in my creativity classes and workshops. It clearly generates an atmosphere of openness, relaxation, and affability which facilitates creativity” [Couger, 1995].

If we, as trainers, can put our participants in a relaxed, receptive, child-like mood via laughter and fun, the training experience will be a joy for everyone concerned. Humor, enjoyment, and learning are not antithetical to one another [Eitington, 1996]. The facilitators of this eMatchmaker case study engaged their students in creative problem-solving and critical analysis. In the process, they stretched their students’ thinking modes and brought them to a deeper level of understanding about program design.
HUMOR AS A LEARNING TOOL: CREATING A CLIMATE FOR DIVERGENT THINKING

Creating a climate for playfulness and serious learning requires planning. One of the first steps for an instructor to take is to develop a trusting, mutually respectful, and positive relationship with students. Humor can become a “lubricant” that diminishes the distance between teacher and learner [Klein, 1999]. Humor can find its way into the classroom through an instructor’s behavior and teaching style. One trait associated with effective teachers (rated highly in student evaluations) is a sense of humor. Teachers who value and feel comfortable with humor can set a tone of playfulness in their classrooms, no matter how difficult or complex the subject matter they teach. Humor can occur spontaneously in the context of class discussions, provide an opportunity to personalize a response to a student (e.g., “kidding around”), or motivate students to participate under less-threatening circumstances.

One effective strategy utilized by instructors that helps create a sense of comfort and playfulness is an “ice breaker.” Numerous publications are available that provide examples of ice breakers. Ice breakers are “fun” activities that are effective when introduced at the beginning of a semester or program to promote interaction, and to develop a sense of community.

Interactive “exercises” such as role-playing, games, or simulations provide other opportunities for the integration of humor. Serious subject matter can often be addressed in the context of these exercises, which provide a low-risk situation for students to think innovatively. Finally, the organization of the physical environment of the classroom can help foster interaction, promote “equity,” and personalize the environment. U-shaped or circular arrangements of seats (if possible) keep students “connected” to each other through eye contact.

An atmosphere that sets the stage for playful, creative thinking can be established through initial and on-going interactions with students. By taking these steps, an instructor is able to utilize humor most effectively during formal, structured learning exercises such as eMatchmaker.

SETTING THE STAGE FOR CREATIVE THINKING: PRACTICAL GUIDELINES

There are many resources available that can help an instructor effectively use humor as a teaching/learning device. The easiest way to begin this process is to explore available texts on interactive teaching techniques. A wealth of publications are available that provide concrete examples of exercises or ice breakers that may be adapted to a particular discipline, the context of a course, or specific subject matter. One popular publication is entitled The Winning Trainer: Winning Ways to Involve People in Learning [Eitington, 1996]. Texts on interactive teaching [Silberman, 1995] illustrate ways to:

- get all students actively involved in thinking about subject matter,
- stimulate discussion and debate
- practice skills
- build teamwork
- have students teach one another

Internet resources are another means to develop humor-based teaching strategies. Websites exist for various professional fields (e.g., health care, education, literature) and can be sources of ideas for instructors in all fields. As websites are in flux, an instructor would benefit from consulting a reference librarian for key words to “browse the web” or conduct an internet search process.

Observing an instructor who utilizes humor effectively is an efficient way to gain ideas or strategies that can be applied to one’s own practice. Workshops organized by professionals can also be a source of information (as well as inspiration). Information about humor workshops can be found on the internet. Professional conferences may offer sessions or workshops as well.

Articles written by successful users of humor have useful guidelines for “beginners” – instructors who want to cultivate a sense of playfulness in their classrooms. For example, Weaver & Cotrell [1987] developed a system to help instructors become more comfortable using humor in the classroom. They proposed ten steps to achieve this goal: (1) smiling, (2) being spontaneous, (3) fostering an informal climate, (4) beginning class with a thought for the day, (5) using stories and experiences, (6) relating things to students, (7), planning lectures in segments with humor injected, (8) encouraging a give-and-take climate, (9) asking students for humorous material, and (10) telling a joke or two.

Finally, an instructor can “learn by doing” by experimenting with creative approaches to teaching and learning. Like the students who participated in eMatchmaker, instructors have an opportunity to gain
knowledge by applying the “thinking style” model while reflecting on their practice. In addition to thinking styles, the instructor may want to examine such multidisciplinary exercises, which in tomorrow’s world of global competitiveness, must be considered to be an integral part of the problem solving process and not just another topic for another class or course. The four workshops that accompany this case study are designed to focus on several factors beyond the obvious: multiculturalism, quantifying intangible factors, privacy and security issues, and other topics of equal importance to the use of information technology. Now, we turn our attention to those scholars before us who have made contributions to creative learning followed by design of the eMatchmaker program.

CREATIVE TEACHING AND LEARNING: SELECTED RESEARCH

THE LITERATURE

Creativity education and training has a history that far predates the present emphasis on innovation. Organized corporate efforts to teach people to be more creative go back at least to 1937 when General Electric began a two-year creative engineering program for some of its most promising newcomers. In the aftermath of World War II, there emerged a new level of interest in both the theoretical and applied aspects of creativity. We can suspect that the interest was part of the Zeigeist that followed the war. There was a deepened awareness of the impact of invention in research and development for the rebuilding of a viable security that would permit everyone to develop their creative potentialities to the fullest.

Interest in creativity as the object of scientific study was stirred by J. P. Guilford’s [1950] presidential address to the American Psychological Association entitled “Creativity.” During his address to his fellow psychologists Guilford pointed out how badly they neglected the topic of creativity:

“The most common complaint I have heard concerning our college graduates is that while they can do assigned tasks with a show of mastery of the techniques they have learned, they are much too helpless when called upon to solve a problem where new paths are demanded.”

A similar history applies to almost all the common principles taught in the name of creativity training or creative problem-solving. The general concepts—developing mental flexibility and tolerance for ambiguity, principles of suspending judgment, trying for quantity (of ideas) first and quality second, convergent vs. divergent thinking [Guilford, 1967], vertical vs. lateral thinking [DeBono, 1970], relying on intuitions instead of logic, trying to tap the unconscious mind.

A literature search summarized by Table 1 reveals the various types of thinking that were investigated over several decades. It is not appropriate to discuss all the elements of each of the selected twenty theories noted in the Table 1; however, some brief comments will provide a backdrop to the various types of thinking necessary for students to explore assumptions, constraints, issues, and problems depicted by the eMatchmaker exercise which is designed to force students to think in one or more of these ways.

The specific techniques are time-honored: brainstorming, thinking by analogy, attribute listing, force-fitting words or ideas or smells or sounds, checklists, synectics, morphological analysis, morphological speculation, imaging, guided imaging, and semi-guided imaging. Karl Albrecht (1980) is skeptical of the premise that creativity training was catching on as a significant, mainstream force in the business world and in universities. Indeed, while the list of organizations that have sponsored workshops is impressive (IBM, General Motors, Hewlett-Packard, Colgate-Palmolive, Shell Oil, and Central Intelligence Agency to name only a few), creativity education is by no means entrenched in the curriculum in the same sense supervisory training is entrenched in corporations. At present, relatively little emphasis is given to creative teaching methods. Instead, there is a disproportionate emphasis on traditional teaching methods with the absence of practicing the art of creative thinking in problem-solving.
PSYCHOLOGICAL THEORIES OF CREATIVITY

Please refer to Table 1, which lists the major research efforts chronologically. Sigmund Freud dealt with creativity exclusively from the point of view of unconscious motivation (self-conflict). To Freud, it prevails in dreams, and some mental illnesses especially psychosis. For practical purposes, when the body and mind are deeply relaxed, the brain pattern actually changes and becomes slower. This deeper, slower level (alpha level) differs from the usual busy working conscious (beta level). Interestingly enough, the alpha level has been found to be far more effective than the more active beta level in creating real changes in the so-called objective world as practiced in the art of creative thinking.

TABLE 1 - SELECTED RESEARCH ON CREATIVE LEARNING

<table>
<thead>
<tr>
<th>Researcher</th>
<th>Topic</th>
<th>Results</th>
<th>Educational Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sigmund Freud 1955</td>
<td>Dream Interpretation</td>
<td>Unconscious Motivation (Convergent/Lateral/Divergent Thinking)</td>
<td>Self Conflict Neurosis in Creative Thinking</td>
</tr>
<tr>
<td>Joseph Walas 1926</td>
<td>Art of Thought</td>
<td>First Stage Theory</td>
<td>Application to Creative Thinking</td>
</tr>
<tr>
<td>Joseph Rossman 1931</td>
<td>Psychology of Inventors</td>
<td>Walas’ Expansion of Stages</td>
<td>Application of Extended Theory</td>
</tr>
<tr>
<td>Carl. G. Jung 1933</td>
<td>In Search of Soul: Jungian Aesthetics</td>
<td>Convergent/Divergent Thinking Unconscious Animation</td>
<td>Creative Product is Person’s Archetype</td>
</tr>
<tr>
<td>B. F. Skinner 1938, 1971</td>
<td>Beyond Freedom and Dignity</td>
<td>Reinforcement Theory</td>
<td>Selective Perception in Creative Thinking</td>
</tr>
<tr>
<td>W. J. Gordon 1961</td>
<td>Synectics</td>
<td>Group-based Creative Problem Solving</td>
<td>Creative Environments and Reason by Analogy</td>
</tr>
<tr>
<td>George Prince 1970</td>
<td>Practice of Creativity</td>
<td>Popularized Synectics</td>
<td>How to Develop Creative Capacity</td>
</tr>
<tr>
<td>M. Wertheimer 1945</td>
<td>Production Thinking</td>
<td>Creative Thinking through Gestalt</td>
<td>Association by Gestalt for Creativity</td>
</tr>
<tr>
<td>J. P. Guilford 1950, 1967</td>
<td>Creativity: Structure of Intellect</td>
<td>Intelligence not related to Creativity</td>
<td>Factorial Approach to Cognitive Activity</td>
</tr>
<tr>
<td>Douglas McGregor 1960</td>
<td>Human Side of Enterprise</td>
<td>Theory Y</td>
<td>Identified ‘Spirit’ required of Teacher</td>
</tr>
<tr>
<td>E. Paul Torrance 1962</td>
<td>Torrance Test on Creative Thinking (TTCT)</td>
<td>Verbal and Figural Creativity</td>
<td>Finding Highly Creative Students</td>
</tr>
<tr>
<td>S. A. Mednick and M. T. Mednick 1962, 1963</td>
<td>Remote Association Test (RAT) for Creativity</td>
<td>Associative Thinking and Stimulus Response</td>
<td>Teaching from Unrelated Concepts Use of RAT</td>
</tr>
<tr>
<td>A. Koestler 1964</td>
<td>Art of Creation Insights and Outlook</td>
<td>Habitually Incompatible Contexts</td>
<td>Association and Creative Thinking</td>
</tr>
<tr>
<td>W. Tuckman 1964</td>
<td>Interpersonal Topical Inventory</td>
<td>Integrative Complexity and Creativity</td>
<td>Highly Creative Students (Abstract Reasoning)</td>
</tr>
<tr>
<td>E. Debono 1970</td>
<td>Lateral Thinking</td>
<td>Measurement of Verbal/Figural Lateral Thinking</td>
<td>Student Perceptual Styles in Problem Solving</td>
</tr>
<tr>
<td>P. K. Ottmann 1971</td>
<td>Group Imbedded Figures</td>
<td>Field Effects on Creative Thinking</td>
<td>Highly Creative Students</td>
</tr>
<tr>
<td>Kelly, Littman, Peters 2001</td>
<td>Art of Innovation</td>
<td>Handbook on Lessons in Creativity</td>
<td>Fostering Climate for Innovation</td>
</tr>
<tr>
<td>T. Tharp 2003</td>
<td>Creative Habit: Learn it and use it.</td>
<td>Exercises for Creative Thinking</td>
<td>Preparation for Creative Thinking</td>
</tr>
<tr>
<td>M. Gladwell 2005</td>
<td>Thinking without Thinking</td>
<td>Focus on the details.</td>
<td>Utilize Case Studies in Creative Thinking</td>
</tr>
</tbody>
</table>
Although motivation is not a phenomenon specific to creativity, many researchers in creativity have worked within the Freudian frame of reference of id, ego, and superego. With regard to motivation to be used in creative teaching methods, simply refer to Douglas McGregor’s seminal work [1960]. The late Sloan Professor of Management, MIT, created a new taste across the entire field of management and the newer fields of organizational behavior and organizational development. Just as every economist pays his dues to Keynes, creative teachers of creative thinking methods are disciples of McGregor. He developed a new paradigm that stressed human creative potentials, emphasized human growth, and elevated the human role in industrial society as well as in the creative classroom—his later-to-be developed trademark now immortalized by the simply initial “Y” introducing a new theory for examining our assumptions (explicit and implicit) about the most effective ways to teach creativity, partly influenced by the psychological theories of self-actualization.

Also within the framework of psychological theories, Carl Jung [1959] made a significant contribution to the study of creativity, especially in reference to the aesthetic process. Jung believed that we might gain intuitive insights by tapping into the collective unconscious. It is easy to recognize that Jung’s concept of the “collective unconscious” colors his whole theory of creativity just as the concept of the “libido” colored Freud’s.

It is evident from psychological research, that the human mind is bicameral in nature. That is, it has the capacity to think in two modes: convergently/vertically and/or divergently/laterally and to create a balance between the two modes of thinking. Traditional teaching methods, especially with its emphasis on lecturing, emphasize disproportionately the convergent/vertical mode and is usually a passive activity without enough interaction. By contrast, the creative teaching method is an active process that promotes a lot of interaction through promoting thinking in the divergent/lateral mode balanced with the convergent/vertical thinking. Unfortunately, traditional teaching, the ability to memorize and to repeat arbitrary information is highly valued, and creativity, inventiveness and originality are ignored. The eMatchmaker exercise is one that promotes, even forces, students to think in all of these ways not only to design the computer program to find one’s mate for life, but also to look at the many factors of selling the product on the internet. You may call this type of activity creativity, imagination, ingenuity, freshness, originality, or just a flare for solving problems, but most people believe “creativity” is a special gift, an innate capacity possessed by a lucky few people. And, if you don’t have it, there is little or nothing to be done about it, except to take your problem to someone who does.

There is another radically different view of creativity. J. P. Guilford [1959] wrote whatever the more creative person has seems to be no different than others except in degree. Osborn [1957] believes that creative talent is normally distributed, and that all of us possess this talent to a lesser or greater degree. It follows that the creative process is to be found in every individual, not merely in the chosen few.

BRAINSTORMING, SYNECTICS, AND LATERAL THINKING

Alex Osborn [1957] developed brainstorming, a group-based idea-generating technique. People cluster and categorize the ideas, evaluate their potential and recommend the most promising ones to the problem owner. Brainstorming groups have been convened to find new uses for an old product, to name a new product, and develop slogans for campaigns.

J. P. Guilford [1960] is the leading exponent of the factorial approach called the structure of the intellect which views creativity as a function of many separate intellective factors. Synectics is a group-based problem solving technique that stresses control over the creative environment and reasoning by analogy. In 1961, Gordon set out to study synectics through the psychoanalysis of inventors. Synectics comes from the Greek word “synektikos” meaning the joining together of apparently irrelevant elements. Lateral Thinking is a term coined by deBono [1970] representing escape from conventional ways of looking at problems for solution. The very word “lateral” suggests the movement sideways to generate alternative patterns instead of moving straight ahead with the development of one part pattern.
S. A. Mednick [1962] developed a straight-forward type of creativity which stimulated a growing body of research. His associative approach regards creativity as the process of combining mutually distinct associative elements of thought. Creative individuals, he hypothesizes solve problems by juxtaposing ideas not previously related to one another. He provides a detailed description of the Remote Associative Test which seems particularly apropos for studies of free-association originality training because it demands the production of remote associates in the process of solution.

PERCEPTION

James L. Adams [1986] says that “creativity has sometimes been called the combining of seemingly disparate parts into a function whole.” Arthur Koestler [1964] suggests every creative act involves new innocence of perception, liberated from the cataract of accepted beliefs. Perception is the term used to describe how individuals “see” their environment and the elements operating within it. Further, selective perception is basically the application of reinforcement theory [Skinner, 1938] to the perception process. Selective perception means seeing what one wants to see. Given a case problem to solve, such as the one examined here, business executives tend to see the problem in terms of their own organizational functional areas. This type of behavior creates considerable conflict within an organization where functional units should be cooperating in the attainment of common creative goals. Stereotyping is a barrier to creativity because those who stereotype others use selective perception in their communication and tend to hear and see only those things that confirm their stereotype images. Further, if a teacher perceives that his/her students are not creative, if students are treated as though they are not creative, the probability is increased that they will react accordingly. Through this process, stereotypes reinforce themselves and may actually cause the behavior that was originally assumed.

ILLUSIONS

The advantage of visual figures is that material is presented in an unequivocal form. A student may look at the material and make it what he/she will but the material remains the same. This is in contrast to verbal material where tone, emphasis, and individual shades of meaning all give the material an individual flavor, which is not available to others. The study of illusions and related topics is of interest in figural creativity and field independence-dependence. Methods and techniques developed in the study of sensation and perception may be adopted in creativity.
QUALITY CHECK FOR eMATCHMAKER

ASSURANCE OF A QUALITY PRODUCT

There are two aspects to a quality product: 1) does it do what was intended? and, 2) is it “user-friendly” for the intended audience? These are defined as utility and usability [Preece, Rogers and Sharp, 2002]. A good website will address both of these questions.

Considering eMatchmaker’s website, which we will describe in detail in the next section, we need to clearly articulate our goal to the user and have a clear vision for the website. Whether designed in-house or outsourced, we must develop rules, or heuristics, not only for the program itself, but also for web site design. We must have a clear understanding of the end users of this software package and their needs. We must also survey the competition and learn from their weaknesses and strengths. Such activity should be conducted at the outset before any programming code is written. The emphasis for students in this exercise is to impress upon them that quality is an expectation by end users and should be the driving force of any software design.

Quality is established by programming standards, a thorough quality assurance program, and several levels of testing. Most of the user’s perception will come from ease of data entry and the attractiveness of the screen display. Testing must address different size screens, different screen resolutions and different browsers and browser versions.

TESTING THE PRODUCT

There are two elements of product testing: software testing and usability testing. The former is more of a science and the latter more of an art. Usability testing is a continuous process. As the interface and users evolve, testing follows along.

ACCEPTANCE BY BUSINESS MANAGERS, POTENTIAL CUSTOMERS

John Cato notes the raison d’être for websites:

“Webites are for people; people like you and me. Some we might use every day and others we take occasional brief rambles through.”

Using a website, we get to know the organization and feel the character of the workforce. We decide if we want to have a relationship with them and whether we will come back.

So, think of your website as an extension of yourself. It is a reflection of you in the role you have and the context of your world. As a business, you need to convey the style of your corporate culture, and visions for the future of the company, its customers, staff and suppliers. The whole message is on your website; you and your website are not separate things.

FIGURE 3 - KNOW THY USER
Whatever you design, it will create an effect on the person who enters it and interacts with it. As Thoreau said "it is the mark of the special man to raise the quality of the day." As designers, we might try to do this when we create a website. When you think of a website, you might think of many different things, including information, e-commerce and shopping, or enjoyment and advertising [Cato, 2001].

**CAPTURING STUDENT INTEREST WITH THE RIGHT SCENARIO**

**FINALLY, eMATCHMAKER: FINDING A PARTNER FOR LIFE**

This topic is good for upper undergraduate or graduate students. The authors have not written a case study for the online electronic matching of partners, nor have they written a real computer applications program to assist hopeful enrollees in their quest for the perfect partner. The idea for this exercise emerged in a heated discussion about the “unthinking” and indiscriminate use of commercially available software, or computer-based services, to meet customer need. In a subsequent discussion of databases and student concern of privacy and security issues, a more structured approach was tried to get all the students behind the computer screen and examine the many implications of “programming” and why it is necessary for everyone, including customers, to have deeper insights about program design so that they know what they are buying. A scenario for engaging students in an interesting problem, keeping them interested with highly interactive questioning by the teacher, exercising their mindsets for left and right brain activity, and finally, coming to some conclusions about the insights they learned through the exercise, are the objectives of the exercise.

It would be difficult, if not impossible, to describe all the elements of this specific exercise. The scenario is easy to describe: How would you like to complete an online questionnaire and have the eMATCHMAKER system check the attributes you want in a mate (derived from your questionnaire) answered by the one in our database who best fits that preference?

It will cost you $50 for us to provide you with the name, address, phone number and picture of that “best fit” and will be sent to your email within one hour of your request and/or payment. For more information, please see our fee schedule. This scenario is fictitious and the authors have no direct knowledge of these matching programs or services, other than what is advertised. Although some programming concepts are introduced here conceptually, no such expertise is necessary to understand this discussion. Figure 4 shows some fundamental concepts of programming from a managerial standpoint. It is easy to understand the basic logic and flow of the program. It becomes more complex right at the outset when one has to define the profile attributes. Preferred age, for example, might be a number in which case the program can easily determine whether or not a particular available record from the database has this specific age or not. If it is yes, then we have an attribute match and we can proceed to the other attributes. If the preferred age is a range of values, the programming logic must account for this definition. As the attribute definitions become “fuzzier,” complexity increases and the world of linguistic ambiguity arrives. For the end user of this program some questions immediately should arise:

Does the questionnaire provide attribute definition that allows some flexibility in matching? Do some of the attributes automatically rule out a match without checking the entire list? Is the attribute list a complete list? How does one measure the twinkle in the eye or other interesting features or behaviors that may defy measurement? As one moves into higher education, hopefully more higher order thinking skills are demanded of students [Manning, Cohen, and DeMichiell, 2003] and more emphasis is spent on collaborative and diverse thinking skill development [Wysocki, 2002].

Once discussion is underway, the idea is to continue to add complexity by adding more variables, both precise and fuzzy, and see how it affects the programming approach. Another added approach would be to divide the class into two groups: IT professionals who would be designing the program, and other business professionals who would be marketing and distributing the package to customers.

All the class needs is a detailed explanation of Figure 4, some information about profile matching (wanted mate profile versus those searched in the database), and some time for each group to think strategically, operationally, and analytically about these questions: Who prepares the questionnaire and how do we ensure that its assessment will provide the right attribute list? What will be the
components of the package and how do we market and price it? Once the package is implemented, how do we ensure maintenance of the program? What shall we charge for the online service?

FIGURE 4 - eMATCHMAKER

Computers are good at....
Inputting Data, Calculating, Processing, Saving, Reporting
Comparing through Logic (if, then, else)
Looping, Nested Looping

Input 1: Wanted Profile (Record) of Attributes.....processing a customer for
Input 2: Available Profiles (Records).....submitted by customers to be in

Check available records (profiles) in
   check each attribute of that available record, compare to
      Save attribute match temporarily, go to next attribute
      [Several logic statements necessary to define
       "match"...omitted here]
   end, completed loop for all attributes
      Compare this new available record with one saved
      previously as “best fit”
      If this one is better fit, replace it; if not, leave the old one
      stored as best fit
   end, completed loop of all available records to
      Save, Print record of best fit, Graph profile

Obtaining the “best fit” of the profile wanted to the database of available profiles needs to be clarified further. This explanation is to provide the teacher with some insights behind the programming logic necessary for the program to be written. Conceptually, the objective is to check each attribute for a good match, which means that some type of score has to be established for the “fit” to each attribute. If the wanted profile requires a six-foot individual, then how good is the fit if the profile under consideration is 5’11”? Some score on each attribute could be fabricated (perhaps on a scale of 0-10, for poor to good) so that a total score for each person considered for a good match can be calculated. The “scores” would indicate how good a fit was performed by the program. Out of a maximum of 1000 points (100 attributes of 10 points each), a score of 850 would be better than 750, etc. In addition to a total score, one could write a program to “save” not only the total score also scores of each attribute displayed graphically in the form of a profile chart plotted against the wanted profile.

Another major issue that arises in formulating a solution, hopefully a design developed with direct input from business managers in addition to technology specialists, is whether or not a single attribute can eliminate someone from further consideration. For example, if the customer who wants a mate designates that one attribute requirement is for a Catholic person only, and the profile under consideration is a Protestant, then does this really mean that the person will not be considered further, even if the total score may be 950? This reasoning is necessary to identify the business rules, which
become an integral part of the program logic. It is easy to understand that this process is tedious, demanding, meticulous and necessary for the product to sell.

UNCOVERING EVEN MORE ISSUES, PROBLEMS, SOLUTIONS

The remainder of this segment will be presented in the form of a typical conversation between teacher (T) and students (S) concerning this topic. It is not instructive to continue this dialog to its completion, which would take a few hours, but it will give the reader an idea of the active learning technique focused on insight, not programming skill building. The “customer” in this conversation is the person who wants the database file checked for best match.

Dialog: Teacher and Student

T: The program of Figure 1 requires constant modification. If we wanted to have some attributes of this fictitious list of perhaps 100 items be checked for a best fit, what would be some possibilities for those yes/no attributes? In other words, if the customer looking for a mate completes the questionnaire with a preference for “catholic,” as a religion, and the question is worded so that this attribute is at the top of the sequence to be checked, why bother to check anything else if the current available record shows “protestant?”

S: Piece of cake. Just program it (somehow) to go to the end of that loop when it occurs. But suppose the preference is for “catholic,” but the customer really is more flexible than that. Maybe something could be worked out so religion is not that big an issue. How would we handle this scenario?

T: We cannot have “linguistic ambiguity” when it comes to a program and the more flexible we want to be, the more difficult it is to program. It can be done, but at a cost of development time.

S: So, who cares about development time? We charge the customer more and make up the difference. Isn’t this what we call “added value?”

T: Yes, that is true, but there is some threshold when the added value is overwhelming, results in lower sales, maybe not wanted by most of the customers, and therefore not worth pursuing.

S: I use MS Word and it has many “added value” features.

T: Do you know that most users only need a small fraction of the features?

S: Then why put them in the package?

T: Maybe to continue to hold market share. Perhaps, the IT professionals found some new techniques and looked for an application to show their expertise. Maybe we should think about all of this when we purchase software packages. Back to the exercise…what specific insights have you learned from this discussion thus far?

S: One insight is that computer-generated solutions are more complex than they appear. [In this scenario, once again, professor, you have taken a simple matching situation and make it complex.] And, how does one check the program logic? Is it consistent with decision logic?

T: How valid do you think these programs are? You don’t know, without asking, if the database had 500 records or 5 records. So, “best fit” may be meaningless. Furthermore, maybe your best fit record was just removed a minute ago by someone else. Best fit…meaning? The typical user would not be able to enter into the source program and check it out…would have to rely on the reputation of the builder and/or use a lot of test data for which the results are known.

S: OK, I get it about the questionable best fit. Why are these questionable products on the market?

T: Because there are millions of people who are lonely and looking for the quick fix for compatibility. Try the arithmetic. Please send fifty dollars for a single inquiry and get a name. Multiply that amount times several million inquiries. Once the program is developed, it can handle the processing with ease. Now, what other insights do you have? Any insights related to global considerations? Is the computer programming logic valid? Can you think of other fuzzy attributes that should characterize the profile of the “wanted” mate?
KEEPING AN EYE ON THE “END GAME” WITH WORKSHOPS

The end game is for students to gain insights about the use of information technology and be able list them at the conclusion of the exercise. The insight should be on all aspects of the exercise: focus on an interesting project, examine the scenario for the relevant tangible and intangible facts, use multidimensional thinking skills in uncovering the problems and a solution, thinking about disciplines other than the technology associated with information, such as global systems, value systems, business and management issues, ethical considerations, financial concerns, and human resources issues.

Limited space for this journal article does not allow for definition of workshops designed to highlight all of these insights; however, we can make available the workshop structure, as presented during the conference with full audience participation, to anyone who wants this material.

BUSINESS DECISIONS FOR eMATCHMAKER

NEED FOR BUSINESS AND IT DESIGNERS TO COLLABORATE (CREATIVELY)

If an enterprise is to be successful in this global competitive marketplace, it must use information technology (IT) to advantage. Customers, including those who subscribe to services such as eMatchmaker, expect immediate response, quality and complete service, and reliability in terms of maintaining that relationship over the life of the product or service. The relationship among the ultimate customer, the company that sold the product, and the IT designer is very important for proper design to meet customer specifications [Liftman, 2004 and Maracas, 2003]. Collaboration is the key element. Formal collaboration and documentation must be present in order to form the basis of continuing that dialog from inception through implementation of any project [Wysocki and DeMichiell, 1997].

The collaboration should be creative problem solving. Faculty should nurture such thinking and through exercises such as the eMatchmaker scenario, students and practitioners should explore many avenues of solution, question assumptions and constraints, and move toward the best solution. In the exercise here, students should strive to be active participants in the learning process and not just passive listeners. They should collaborate with each other, communicate their ideas and conclusions in the most effective manner, and take the time to reflect and evaluate their solutions. Creatively does make a difference [Couger, 1996]. Creativity does take more time; more time for the teacher to prepare exercises and case studies, and more time for students to explore the scenario. This process may not be efficient, but it is effective. Also, Couger suggests using a divergence-convergence model to promote creative approaches in the classroom.

The authors have used this model extensively in different courses and have found it useful. In the eMatchmaker exercise, divergent thinking is required at the outset and once one set of attributes are used to formulate a “programmatic” solution (convergence), the mindset is switched to divergence again. The cyclic movement of thinking between divergence and convergence has proven to be a good technique to nurture creativity and other higher order thinking processes.

CONVERGING WITH INSIGHT TOWARD A PRODUCT

Once a solution is in sight and the divergence/convergence model has been used appropriately, it is time to become more realistic. At the outset, some reality checks were introduced in limiting the number of questions, which would produce the attribute list. It would be foolish to ask someone to complete a questionnaire of 500 items. Computer programs can check these attributes quite easily; but are all of them necessary? Technology can do it, but should it?

Insights in the form of questions like this are valid conclusions for the insight exercise. A product has been identified, discussed, designed, and is ready for implementation. The next two sections will complete a quality check and issues regarding the sale of this product on the internet.
SELLING eMATCHMAKER ON THE INTERNET

“Urban life has dramatically increased the transaction costs for finding suitable spouses, friends and sexual partners. Walk into any singles bar and you’ll see why. The darkness, noise and altered mental state of the patrons increase, rather than decrease, search and information costs.” [Downs and Maui, 1998].

eCOMMERCE: CURRENT TRENDS IN THE MARKETPLACE

The business challenge of the Internet is developing the “killer application.” Downes and Mui [1998] define a killer application as “…a new good or service that establishes and entirely new category, and by being first, dominates it, returning several hundred percent on the original investment.” While not purely a killer application, online dating services exhibit many of the profit characteristics. The marketplace is filled with wannabes.

How Big Is The Online Dating Marketplace?

• $398 million in revenues in 2003. $642 million by 2008. Jupiter estimates that about 20 million singles are currently using online dating services. Jupiter projects by 2004, 40 million people will be using these services.

• Western European dating markets will be worth an estimated EUR 40 million this year and rise to EUR 117 million by 2007 (Yahoo continues, 2003).

• Match.com had 29.6 million unique visitors in January (2004), when a total of 140.5 million people visited online dating sites. Match.com had nearly three times as many visitors as closest rival MatchNet, which had 10.6 million unique visitors to its properties including JDate.com, AmericanSingles.com and CollegeLuv.com. Europe's MeetIC.com took third place with 10.2 million visitors in January. Rounding out the top five were Yahoo Personals, with 9.4 million visitors, and Lavalife.com, with 8.2 million visitors. U.S. consumers spent $109.7 million on online personals in the second quarter of 2003, according to the latest data from comScore Networks and the Online Publishers Association (Top Dating Sites, 2004).

But, it’s not as easy as it seems. AOL, with its huge base of subscribers, has never managed to establish a presence. But, with one in ten U.S. users looking for love online [One in ten users, 2002], there is money to be made.

THE CHALLENGES AND OPPORTUNITIES OF THE BUSINESS OF ONLINE DATING SERVICES (ODS)

Metcalf’s Law establishes the value of your service. More communication nodes and potential mates suggests that there is more value. The first step to increasing value is aiding the potential suitor in his/her quest for a mate. Numerous studies, tests, algorithms, etc. have been tried but the preferred technique is viewing a picture. With this in mind, some services have expanded up to 25 pictures and even added video to lure the lovelorn [Match.com Upgrades, 2003]. In our eMatchmaker discussion, note that the focus is on narrative data, or attributes defined by words, and not on images, which complicate the program considerably.

What makes a website credible? Numerous studies have addressed this question. Studies by B.J. Fogg at Stanford University [2002] define the credibility of website as the sum of perceived worthiness and expertise. Fogg defines four types of web credibility: presumed, reputed, surface and earned.

Sultan, Urban, Shankar & Bart [2002] provide a simpler view. Their study concluded that “Web site characteristics such as privacy and security, navigation, presentation, brand, and advice account for as much as 98% of this explained variance in Web site trust. Surprisingly, over 80% of the explained variance in Web trust is due to factors other than privacy and security—mainly navigation, brand, advice, absence of errors, and presentation.”

Privacy considerations in online dating services require a delicate balance. Too much privacy stifles communication between subscribers. Too little privacy detracts from the credibility and trust necessary to attract and retain subscribers. Kate Delhagen, an analyst at Forrester Research, has come up with five lessons every company should learn when it comes to privacy [Nee, 2004]. “Never underestimate the
power of privacy bombs.” Small incidents can grow into big problems. Constant attention to security is essential. “Don’t mess with your customer’s data.” Advertisers are seeking information of the kind ODS sites maintain- detailed preferences of a relatively affluent population. Yielding to the temptation of sharing could be disastrous in the long run. “Designate a point person.” One person must be devoted to monitoring and advising on privacy issues. “Revisit your privacy policy and training plans—now.” Privacy needs to be pervasive throughout the organization. “Don’t think privacy protection is a do-it-once-and-it’s-done thing.”

FIGURE 5 - PRIVACY

There are some positive factors. The number of possibilities boggles the mind. Most services offer tens of thousands of potential matches. Since September 11th, people feel safer at home but still need to play the mating game.

The good news is that if your potential mate is truthful, the services have enough information for a good match. The bad news is that you have to give up so much personal information that you are a potential target for greedy Internet advertisers. ODS sites have exceptional “stickiness,” users spend much more time at them than other sites. This makes them especially attractive for those looking to target ads and ODS’ must protect your personal information.

One audience that has been easy to attract to these sites is married people. Never has cheating been so easy. “The Internet will soon become the most common form of infidelity, if it isn’t already. All I have to do is turn on my computer, and I can choose from thousands of women. (It) can’t get any easier than that” [UF Study, 2003]. Differentiation among sites is a challenge. Entry costs are low. There have been many approaches to creating specialized sites. Focusing sites by religion, race, geography, etc. has resulted in sites for Jews, Mormons, African Americans, Hindus, etc. Specialized software can make sites more attractive. PerfectMatch’s SmutBot screens out inappropriate adult content to ensure a positive experience.

Those seeking a mate are no strangers to credibility issues- offline or online. Who is this person?

3. Is that picture really him/her?
4. Did he/she really write this eloquent introduction?

There are some positive factors. The number of possibilities boggles the mind. Most services offer tens of thousands of potential matches. Since September 11th, people feel safer at home but still need to play the mating game.

The good news is that if your potential mate is truthful, the services have enough information for a good match. The bad news is that you have to give up so much personal information that you are a potential target for greedy Internet advertisers. ODS sites have exceptional “stickiness,” users spend much more time at them than other sites. This makes them especially attractive for those looking to target ads and ODS’ must protect your personal information.

One audience that has been easy to attract to these sites is married people. Never has cheating been so easy. “The Internet will soon become the most common form of infidelity, if it isn’t already. All I have to do is turn on my computer, and I can choose from thousands of women. (It) can’t get any easier than that” [UF Study, 2003]. Differentiation among sites is a challenge. Entry costs are low. There have been many approaches to creating specialized sites. Focusing sites by religion, race, geography, etc. has resulted in sites for Jews, Mormons, African Americans, Hindus, etc. Specialized software can make sites more attractive. PerfectMatch’s SmutBot screens out inappropriate adult content to ensure a positive experience.
Alternative communication methods (chat, live voice, etc.) offer new choices. If all else fails, free trials are the most common way to introduce a new service on the Internet [More Subscribe, 2003]. In the best of all worlds, your seekers will quickly find mates and live happily ever after—reducing your income by two subscribers per month. Are ODS’ an online pyramid scheme where few subscribers achieve their goal?

If students explore in depth this exercise, they will discover that the above issues can surface; since the goal of the exercise is to market eMatchmaker on the internet, certainly these issues must be addressed. What started out to be a rather limited programming task turns into a very complex design and selling academic experience. In the process, the students will have touched upon all of these variables, business rules, constraints, and marketing options.

THE FUTURE OF ONLINE DATING SERVICES (ODS)

The future of ODS will evolve primarily with expansions in available bandwidth and computing power. More sophisticated algorithms for selection will be possible. This exercise is meant only to open the minds of students for them to become aware of the insidiousness and complexity of software programs they may use. The numerous examples provided in the previous sections would be the information the students would uncover as they progressed through the discussions. Wireless communication paths will extend access mobile and agile subscribers in this world of immediate gratification and accompanying work and life mobility. Better security will entice the faint of heart. More bandwidth will result in even more video and someday, holograms, the ultimate alternative to the bar scene will be commonplace. It may even exacerbate the movement toward virtual dating with its lifelike imaging replacing actual meetings of the individuals.

CONCLUDING COMMENTS

We have tried to integrate many disciplines, starting with the one, which is so pervasive in society today, namely information technology. The initial thought of using a computer program to start the process was unplanned. The topic arose in a recent class of doctoral students in a required information technology management class when we discussed the issue of privacy of databases and the conversation moved into online dating services and the problems associated with such heavily marketed programs to very large numbers of people throughout the world.

It was clear that the students were “engaged” and eager to learn more about the software, which prompted writing one with them, unrehearsed and with sufficient detail to keep their interest. This moment of teaching/learning exemplifies one of those “subconscious hunches” of Gladwell [2002, 2005] who suggests that a few seconds, or a “blink” can sometimes replace hours and days of planning the exercise and sometimes is the correct solution to the problem. This concept is especially important when considering strategic initiatives that usually require much supporting data and some cost/benefit analysis. In some cases, it appears (from Gladwell’s data) that instinct, intuition, and/or quick judgment can initiate actions that do not require all that analysis and can produce solutions that are just as good as using the analytical approach.

After discussing this experience, we concluded that it could evolve into a case study expanded to include other tools and techniques of promoting creativity (humor, creative learning, software quality measurement, and use of the internet in selling such a product), it became clear that these activities should be integrated into a common theme for use by other educators. Again, the objective is to engage students creatively in some relevant scenario so that they are forced to exercise different types of thinking skills in a new “idea revolution” world [Warmke, 2003] and derive some insights from the experience.

The following chart (Figure 6) depicts the five segments of the learning experience in the form of three gears and some conclusions from our experience using creative techniques.
FIGURE 6 - CONCLUSIONS FOR EDUCATORS

<table>
<thead>
<tr>
<th>You have read about selected referenced experts and from the authors’ experiences...here are some conclusions reached by the authors in their collective wisdom.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All three gears (segments of this paper) must turn together, in the right direction, at the right time, and with the right staff.</td>
</tr>
<tr>
<td>It should be a long-term arrangement of activity, well oiled.</td>
</tr>
<tr>
<td>Creative thinking awareness can lead to creative, fuzzy mental models.</td>
</tr>
<tr>
<td>Creative learning can be prompted with activity, projects, and case studies.</td>
</tr>
<tr>
<td>Humor can be more effective in retention of concepts than straight lecture.</td>
</tr>
<tr>
<td>Implications of quality and eCommerce are pervasive and important to grow.</td>
</tr>
<tr>
<td>Information technology can engage and “enable” students to see beyond the obvious.</td>
</tr>
</tbody>
</table>

Engage students to think and provide a scenario for reflection and development into our executive leaders and managers of tomorrow.

As the insight exercise evolved during the past two years into a full half-day or more program with workshops, it was evident that students could work on the project both during and after class sessions. “Thinking teams” were created for workshop activity to focus on one or more of the four thinking style quadrants (analysis, process, people, and strategy). In direct agreement with recent articles on the need for teachers to go beyond the large lecture course and into interactivity [New York Times Special Edition, 2005], MIT and other institutions of higher learning are rethinking their introductory courses and leaning more toward “technology enabled active learning.” Such approaches might cost more money, but we think the quality of the learning experience is worth it. From student evaluations of the use of this teaching style, students agree. They were motivated to engage in this climate of creative learning to design and develop a software product of marketable value. They recognized the need to be more aware of the business rules behind the program and the need to be proactively involved in product development.

REFERENCES

**Thinking Styles, eMatchmaker Design, Workshops, Conclusions - Dr. Robert DeMichiell**


**Humor in the Classroom, Humor and Creativity - Dr. Amelia Klein**


Klein, A. All I Needed to Know I Learned in Kindergarten: Applying case Studies to Early Childhood Teacher Education Programs. In M. Sudzina (Ed.) *Case Study Applications for Teacher Education*. (Allyn & Bacon, 1999).


**Software Quality, Selling eMatchmaker on the Internet - Dr. Richard Manning**


Nielsen, Jakob & Tahir, Marie, Homepage Usability: 50 Websites Deconstructed (New Riders, 2002).


Creative Learning Research, Tools and Techniques - Dr. Thomas Griffith


Wallas, G. *The Art of Thought* (Harcourt Brace, 1926).