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University Level Engineered Learning

Joseph Lapides, P.h.D.

Abstract

Engineered Learning is a new approach to learning. The author of this paper was a reviewer for the forthcoming Engineered Learning Sourcebook. This article illustrates the application of Engineered Learning in graduate level courses at the University of Michigan-Dearborn. It shows that the Engineered Learning principles mesh with and extend successful teaching practices. In addition, it provides new tools to improve learning outcomes.

University Level Engineered Learning

By: Joseph Lapides, P.h.D.

Introduction

"Front line" teaching at a University level has given me a range of successful teaching methods. Some of these arose from experience. Others were gathered from different theories. One of my sources was Dr. Gary Salton, the creator of Organizational Engineering and human information processing theory. Dr. Salton's insights clearly apply to teaching. However, his work centered on organizations, my focus was on teaching.

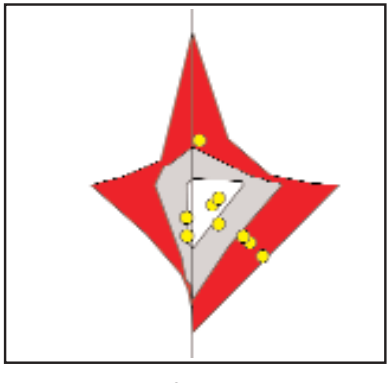
Dr. Salton asked me to review the first draft of the Engineered Learning Sourcebook (Salton and Daly, 2004) in early 2002. This book centered on my field of interest. Insights expanded as we discussed points and clarified concepts. Understandings I had gained from practice became even more explicit. Everything began to fall under a common umbrella. What had been a "hodge-podge" of unrelated techniques suddenly came into focus.

The value of a common theory cannot be overstated. I teach others to teach. I can now explain "why" a particular practice works, "where" it works and "how" to execute it. I can also use the light shed by the theory to make my own new discoveries. The theory gives us a lens to help enhance learning to ever greater levels. The impact of Engineered Learning is cumulative. It builds on and extends what we already know.

The Setting

My career has been as a Professor with the University of Michigan-Dearborn. A majority of the courses I teach are graduate level. The students attending the courses tend to be between 20 and 30 years old. They are typically employed full time. They are working on advanced degrees to improve their career prospects. Many are employed as beginning-level professional engineers. They tend to have a practical, problem-solving orientation. In terms of Engineered Learning (EL), this translates into an LP/HA strategic style. The composition of a recent class is shown in Graphic 1.

Graphic 1



Engineering favors people who can pay attention to detail over long periods. They tend to be skeptical. New knowledge is not accepted at face value. This makes sense since, in their world, small mistakes have big consequences. Finally, they are not a tolerant group. They know what they are doing. They expect their professors to be equally well qualified. Teaching strategies must accommodate their rigorous posture.

Some of the subjects I teach include organizational learning, OD and management. This is not the "natural turf" of people who are used to the hard-edged world of engineering. Specific formulas are replaced with general concepts. Correlations substitute for direct relations. To them, the knowledge to be gained in my courses seems "fuzzy" and uncertain. This bias must be overcome if they are to be equipped to become future leaders of our society. The teaching challenge is substantial.

Motivation

Engineered Learning sees two bases for motivation. Rational motivation is the "what's in it for me factor." The level of attraction less the amount of aversion sets the strength of motivation. The more attraction exceeds aversion, the greater the rational motivation.

Rational motivation is not an issue at a university. The students are in pursuit of a degree. Obtaining a degree requires passing courses. Passing courses requires learning. They walk in with high rational motivation.

Emotional motivation is another issue. Engineered Learning defines this as a "feeling." This is a physical phenomenon. Altering emotions changes the biochemistry of the body. Doing this accesses the student at a primitive level. The effects of emotional motivation are powerful. For example, if you are feeling "on top of the world" you are likely to be receptive to new knowledge. If, on the other hand, you are in a dismal mood, knowledge may be hard to acquire.

The challenge when dealing with the LP/HA styles is that they tend to

look on emotion as a negative. It gets in the way of the logical certainty that they prize. To engage the biochemistry of students requires a bit of clever innovation.

In learning settings, Engineered Learning defines two principal methods of positively changing the biochemistry of students. The first is laughter. The fact that most speeches start with a joke is not accidental. Humor is a way of making an audience more receptive to information. It can have the same role in teaching and learning.

Unfortunately, I am not a strong humorist. In addition, being a Professor limits the ability to use humor. The students are paying tuition to learn from recognized experts. Excessive use of humor can compromise that status. They are not paying their money to be taught by a clown.

The other major tool available is empathy. This strategy plays on the human tendency to share the experience of another. This is an unavoidable condition. It is "built into" the human. It works as well on an LP/HA as on any other strategic style.

The basic empathetic strategy begins at the start of the first class. A "check in" process is used. Students are asked to identify themselves, their interest in the class and to share something personal that might otherwise not be known.

This strategy has several positive effects. First, it strengthens empathetic responses. Sharing personal items creates something of a personal bond. This reinforces the intensity of empathetic responses that will occur during the course of instruction.

The empathetic "setup" is further strengthened by having the students sit in a circle. This gives them full visibility of each other's responses. In sharing their interest in the class, the more committed students transmit some of their enthusiasm to others. Those who are not as committed have only a neutral effect. The net result is that emotional motivation increases.

The remainder of the class builds on this basic "setup." Class activities are designed to cause the students to engage in structured interactions. In other words, a framework is provided that has a strong probability of engaging students on an emotional level. The framework itself provides the HA/LP with a familiar "hand hold." Completely eclectic experiences would cause stress to these disciplined people. The result would be a crash in emotional motivation. Emotions are not bounded by the exercise. The effects of the crash would probably extend into the balance of the course. A serious loss of learning could reasonably be expected.

While structure is needed, it does not have to be a "blueprint." A class on “Building High Performing Learning Organizations” provides a ready example. Students are asked to take a 20-minute walk in pairs. The task is to describe what working in a learning organization would be like. At the end of the walk, they come back and report.

The walk forces the students to take a generalized view. The LP/HA are problem solvers. If given an opportunity they would create lists, equations and systems. Setting the context as a walk forces them to discuss the subject in

broad, personal terms. Emotion is engaged as they frame the subject in terms of their own experiences and circumstances. They "see" themselves in the situation they created in their minds.

There are many other similar activities that engage emotions within structured boundaries. The common denominator is that they all involve a structured social context. The structure appeals to the LP/HA's need for order. The social context introduces a widened scope as well as an emotional tie that engages a student's biochemistry.

The other aspect of emotional motivation is the "checkout." This occurs at the end of a class. Here students are asked to evaluate the class in terms of what it means to them. Questions on how they will use the knowledge links the learning to their lives. This helps solidify the learning in personal terms. The motivation being generated here is to help them carry their learning into the world.

Engineered Learning theory has shown that the very successful strategies used here are not universal. They work with disciplined, problem-oriented students (LP/HA). If the classes were populated by RS styles, the focus would shift. There is little difficulty engaging them. Keeping them centered would be the major concern. Similarly, if the classes had greater RI representation, tools to guide their natural exploration tendencies would have to be created.

This highlights an important point. There is no "one size fits all" model that fits all strategic styles than can be present in a class. The mark of a professional is the ability to make appropriate decisions based on the strategic style mix present in a class. You would not want your doctor prescribing medication without first examining your condition. Engineered Learning has the same perspective. It recognizes a teacher as a professional who must take the condition of their "patient" into account.

Engineered Learning provides insights and tools to aid in making professional judgements. An essence of a professional is to be able to assess situations and apply the right tools to resolve them in a favorable direction. The insights and techniques of Engineered Learning work whether the teacher is a professor or a trainer. Adopting the technology will serve to move the profession forward.

Content

The structure of knowledge is the second most important factor in learning success (after emotional motivation). Here again, the high proportion of LP/HA styles in the typical class allows for the structuring of efficiencies. Even if we did not run a group analysis on each class it would probably be safe to assume that most of the students will favor these styles. In a class in the liberal arts, this would NOT be a safe bet.

The LP/HA has a disciplined approach to life. They typically do not have a problem completing reading assignments. This is especially true when the readings have been selected to satisfy the logical, step-by-step and "to the point " preferences of the LP/HA. It is usually safe to assume that a majority of the class will have read any assignments given.

The knowledge needed to satisfy

course requirements are contained in the textbooks and added readings. There would be a major loss in learning if I were to dedicate a class to repeating what had already been said in writing. Instead, my role becomes one of making the knowledge "real" in the lives of the students. Showing them how it applies is many times more valuable than repetition.

Even situations where the content is in dispute can be handled if you know who you are dealing with. For example, students sometimes challenge the legitimacy of test questions in statistics courses. Quantitative Item Analysis (Kubiszyn and Borich, 1996) is a way of assessing a multiple-choice norm referenced test. Applying it to the midterm exam indicates that about 15% to 20% of the questions are less than ideal. A "perfect" test is an ideal that is seldom attained. This provides an opportunity to use the test itself as a learning (rather than assessment) tool.

It is my practice to wait for an objection. The strong HA/LP orientation of the group almost ensures that it will arise without prompting. The students are then offered the opportunity to use Quantitative Item Analysis to analyze their own exam. They can then report their findings and earn extra points to improve their grade. The "extra points" provide rational motivation. The opportunity to show that they were "right" provides a level of emotional motivation. These motivational incentives are channeled through the lens of their strong analytical abilities to create both a deepening and broadening of their understanding.

Strategies such as focusing on the meaning and substituting explanations for answers is possible because of the make up of the class. I can assume that the readings have been done. This frees me to focus on areas that are not well served by the written material. A different class composition would dictate a different approach.

Were the class populated by RS strategic styles, my efforts would be redirected. It would not be safe to assume that the material had been thoroughly read. Also, the need to relate the knowledge to their personal lives would be less important. The RS typically applies what they learn quickly. They retain what works and discard what does not. Spending a lot of time relating the knowledge to life would be, to some degree, redundant. There is no substitute for knowing the context within which you are working.

The ability to take this approach on content is practical because of the consistency in strategic styles in the average class. Even if I did not have the advantage of having a class profile, my strategy would continue to work. The composition of the courses is remarkably stable. The same may be true of graduate courses in other subjects. However, knowing this is a matter of probability not guesswork. There is no substitute for testing.

If this consistency in strategic styles holds true in other areas, optimal teaching strategies can be devised. There would be no need to prepare for variability. Engineered Learning outlines these different methods but they are not free. Agility costs. Knowledge that consistency exists allows these costs to be avoided. Engineered Learning is not about mechanically applying a preset formula. It is about balancing costs and gains in a professional manner

Environment

Engineered Learning views environmental variables as hygiene factors (Herzberg, Mauser, & Snyderman, 1958). If the hygiene issues are fully satisfied, you reach neutrality. If they are not satisfied, they create a source of aversion (Herzberg, 1966). In other words, hygiene factors are things that decrease rational motivation by increasing the "cost" of learning.

In a university setting, the environmental factors are set in advance and are fairly inflexible. Classes must be held on campus and the physical aspects are fixed. However, there is one element that can be manipulated. This is the availability of "toys." These are little, inexpensive "doo dads" that people can play with and manipulate while the class is in progress.

The value of toys accrues to those in the class who are not strong LP/HA's. While a majority of the class is usually HA/LP, outliers are almost always present. The RS and RI styles are easily bored and readily distracted. Providing toys gives them a means of relief without causing class distraction. This relief lowers the "cost" of learning and improves rational motivation. While it would not be wise to sacrifice the good of the many for the good of a few, doing one's best to help every class member is always wise.

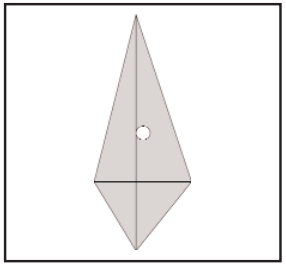
The environment is not a strong factor in university settings. However, to the extent that it can be used, it should be. It is a relatively easy pickup.

Instructor

Engineered Learning identifies the instructor's strategic style as a factor in transmitting learning. This happens because the instructor makes decisions on the information flow. Certain elements can be accented while others are de-emphasized. The pace of delivery, logical consistency and emotional overtones are only some of the elements that an instructor controls.

Graphic 2 displays my strategic profile. I am strongly committed to the RS strategy. I am comfortable operating with minimal detail. Action is my preferred output mode. It is obvious that my profile differs markedly from that of the typical student. If I were to follow my "natural" instincts the learning performance of my classes would plunge.

Graphic 2



Organizational Engineering (Salton, 1996, 2000), the parent theory of Engineered Learning, provides ways out of this dilemma. The first of these strategies is to create and use compensatory mechanisms. In my case, I use detailed agendas. This helps to ensure that a strong logic will permeate my instruction. Awareness of my "natural" tendencies tells me that if I do not use the tool, my students will suffer. That is

not an acceptable outcome. It provides me with all of the motivation I need to use the tool that I have created.

The other principal tool is emulation. Since I know how my students are "thinking" I can put myself in their "shoes." Framing my teaching in their terms helps ensure that they will hear, retain and use the knowledge that they have worked to obtain.

Engineered Learning points out that the strength of the instructor effect is a function of professional teaching skills. The more professional the teacher, the less effect the instructor's profile will have on the learning outcomes.

Professionalism involves moving from the logic of teaching to the logic of learning. The instructor's role is to fit the subject to the learner. Those of us who are interested in the effective transfer of knowledge have learned this through experience. With the advent of Engineered Learning we now have a logic of the "what", "when", "why" and "how" of professional instruction. The ball has been moved forward.

Interaction

Interaction involves the effect students have on each other. The "engineering" job here is to cause students to reinforce learning through interaction with each other. The "setup" of the class (page 3) is a way of establishing preconditions for positive interactions. There are many other ways, which are limited only by the creativity of the instructor. For example, one method I use is "dialogue."

In setting up a dialogue, I frame an issue that relates to the subject. A time limit of 30 minutes is imposed. Students present their thoughts, ideas and beliefs on the subject. They are required to follow certain protocols (e.g., suspend assumptions, listening, expressing views, etc.) that allows orderly communication. Questions are asked, comments are offered and related experiences are shared. During this process a reinforcing network is created. At the end, 10 minutes are given to summarize the discussion and identify what has been learned.

The dialogue again plays into the strategic styles of the typical student. These disciplined people easily accept the "rules" of dialogue. Their rational orientation helps to ensure that the summarization will be productive. Experience with this technique shows that the students start relating the subject to real life issues. They tie it into the organizations of which they are a part. The learning is "burned in." Abstract concepts suddenly become real issues.

An important point here is that the styles have been considered in setting up the dialogue. The technique works with other styles but is especially effective with the HA/LP. Other factors can also affect the selection of interaction techniques. Exercises appropriate to people in their 20s may actually be dysfunctional for a group who are in their 40s. In addition, the position of the people involved might be relevant. Interaction schemes that are appropriate for young professionals may actually be insulting to people whom have reached a senior executive level.

In final analysis, the structuring of interactions among students will lie on the professional judgment of the instructor. The lower the instructor's experience and professional training, the greater the likelihood of dysfunctional interactions. Again, the professionalism of the teaching profession is reinforced.

While guiding interaction is not an exact science, the effort is worth it. It creates a learning opportunity that is unique in effect. It transports the motivation to learn into the motivation to use. It can give experience with the subject in a social context—the venue in which most things will be applied. Done correctly, it increases confidence and improves the likelihood that the learning will actually be applied.

Conclusion

The Engineered Learning Sourcebook (Salton and Daly, 2004) only claims applicability to short duration corporate training events This article shows that real teaching experience at a major university easily falls within the paradigm. This article indicates that its reach may be much further.

The introductory chapter of the book invites others to join the enterprise of reworking the field of teaching into an arena of learning. The author of this article has attempted to demonstrate that this opportunity extends to practitioners as well as theoreticians. The framework is strong and can accept "real" experience as well as abstract variables. Join the enterprise. Working together we can make the world a better place for all who inhabit it.

Author

Joseph (Jerry) Lapides, Ph.D. headed the Master of Arts program in Adult Instruction and Performance Technology at the University of Michigan-Dearborn until his retirement in 2001. He continues to serve on the faculty in a teaching role with a focus on graduate courses in organizational behavior/development. He remains affiliated with the School of Management and the College of Engineering and Computer Science. He is also Adjunct Professor, School of Management, University of Toulouse, France.

Since his semi-retirement, Dr. Lapides chose to remain active as an independent consultant. He prefers shorter-term assignments that leverage his acknowledged abilities in Organizational Engineering, Team Learning and Conflict Resolution.

In addition to his University teaching and consulting, Dr. Lapides periodically offers certification in Organizational Engineering. These seminars are typically conducted on the campus of the University of Michigan-Dearborn and are designed to appeal to practitioners who intend to quickly implement new learning.

Dr. Lapides can be reached at his home office in Southfield, Michigan at: (248) 569-3219 or on his cell Phone at (248) 569-3219. You can also email Dr. Lapides at jlapides@comcast.net.

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Organizational Engineering Institute
101 Nickels Arcade
Ann Arbor, MI 48104

Phone: 734-662-0250
Fax: 734-662-0838
E-Mail: OEInstitute@aol.com

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