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Instructional Philosophy Research Paper

Cognitive Methods:

A Glimpse into the Way People Think, Learn, and Perform

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Learning Philosophy

My personal philosophy covering instructional methods, theory, and techniques can best be synthesized from a cognitivist point of view. More succinctly, I hold a passionate belief that anyone can learn anything with the right combination of:

- Learner Motivation,
- Instructional Systems Design, and
- Learning Sciences.

Learner Motivation

By learner motivation, I mean that learners must have a vested interest in the learning, in order to acquire knowledge or develop new skills. If there is no interest or motivation on the part of the learner, it doesn't matter how good the instruction might be. For a more formal definition of learner motivation, I subscribe to John Keller's ARCS Model of Motivation where ARCS stands for Attention, Relevance, Confidence, and Satisfaction. The definition provided by Keller (1979) is provided as:

Attention. Increase perceptual arousal with the use of novel, surprising, incongruous and uncertain events. Increase inquiry arousal by stimulating information seeking behavior; pose or have the learner generate questions or a problem to solve. Maintain interest by varying the elements of instruction.

Relevance. Emphasize relevance within the instruction to increase motivation. Use concrete language and examples with which students are familiar. Provide examples and concepts that are related to learners' previous experiences and values. Present goal orienting statements and objectives. Explain the utility of instruction for both present and future uses.

Confidence. Allow students to develop confidence by enabling them to succeed. Present a degree of challenge that allows for meaningful success under both learning and performance conditions. Show the student that his or her expended effort directly influences the consequences. Generate positive expectations. Provide feedback and support internal attributions for success. Help students estimate the probability of success by presenting performance requirements and evaluation criteria.

Satisfaction. Provide opportunities to use newly acquired knowledge or skill in a real or simulated setting. Provide feedback and reinforcements that will sustain the desired behavior. Maintain consistent standards and consequences for task accomplishments. Manage reinforcement: keep outcomes of learner's efforts consistent with expectations.

Instructional Systems Design

A review of the literature indicates that there are two fields, each with a vested interest in developing and studying technologies for learning: Instructional Systems Design (ISD), and Learning Sciences (LS). My contention is that an understanding of both is required in order for most learning to occur. Descriptors for ISD include educational technology, educational media, instructional design, instructional technology, instructional systems, and instructional systems technology. Generally speaking, these all point to the same thing meaning: designing materials for learning using the best methods available in order for learning to occur among the targeted audience.

ISD has evolved from its original military training applications in the 1950's, to the creation of human systems of instruction and learning. In more recent years, it has come to encompass issues associated with systemic change

and organizational innovation. Today, the ISD community in North America is best defined by the professional society: the Association for Educational Communications and Technology (AECT). AECT puts out two publications, which are *TechTrends* and *Educational Technology Research and Development* (ETR&D).

Learning Sciences

The learning sciences field is more closely aligned to cognitive sciences and promotes the scientific understandings of learning as seen through the lens of technology. Kolodner (2004) defined learning scientists as those who "harvest theories of active, constructivist, and participatory learning to design software and learning environments and ways of educating that promote deep and lasting learning" (p.37). LS has traditionally been linked to information processing models of learning, whereas ISD has traditionally worked within instructionist models of learning. The LS community is younger than ISD in terms of its professional society, the International Society of the Learning Science (ISLS). ISLS has roots back to 1991 with the Conference of the Learning Sciences held at Northwestern University's Institute of the Learning Sciences. The LS journal, the *Journal of the Learning Sciences* (JLS), was founded at the same time, to bring together cognitive scientists with others in the education field.

Even though both ISD and LS use educational technology as part of their identity, the two fields do not overlap as much as one might expect (Kirby, Hoadley, & Carr-Chellman, 2005). The trend today reflects a growing interest of the two fields in one another, due to the increasingly related nature of scientific understanding and modeling of learning and design-oriented work intended to

drive learning outcomes. However, the two communities continue to exist in relative isolation of one another.

Learning Theory

Cognitive Load

Cognitive load refers to the amount of work that can be completed in working memory, to allow for building, transfer and retrieval of information schemas to long term memory. By extension, the difference between an expert and a novice is that a novice hasn't acquired the schemas of an expert. A good example of this is the way a master chess player plays by recalling different board layouts, rather than memorizing the location of each individual piece.

Cognitive load theory basically suggests that learning happens best under conditions that are aligned with human cognitive architecture. The understanding of cognitive load theory is perhaps best known through the work of John Sweller. “The implications of working memory limitations on instructional design can hardly be over estimated. All conscious cognitive activity learners engage in occurs in a structure whose limitations seem to preclude all but the most basic processes. Anything beyond the simplest cognitive activities appears to overwhelm working memory. Pima facie, any instructional design that flouts or merely ignores working memory limitations inevitably is deficient” (Sweller, J., van Merrienboer, J.J.G., and Paas, F. 1998, pp. 252-253).

There are three sources of cognitive load, which are: intrinsic, extraneous, and germane. Intrinsic cognitive load is directly related to the complexity and interactivity of the new knowledge and skills to be learned. Extraneous cognitive load is a function of how the instructional materials are designed and delivered

to the learner (i.e., split attention and redundancy). Germane cognitive load is extra load imposed using techniques such as diverse examples, in order to support learning transfer. (Diverse examples are known to be more effective than similar examples, in to promoting learning transfer.)

By understanding the different types of cognitive load, it is possible to manage cognitive load in the design of instructional materials and instructional activities so that limited cognitive resources can be devoted to learning processes (Clark, 2003).

Cognitive Task Analysis

The purpose of cognitive task analysis (CTA) is to model the actions and especially the knowledge and thinking that learners engage in when performing a task. In conventional task analysis, the basic procedures and foundational knowledge (i.e., declarative and procedural knowledge) are learned in the classroom, whereas skills are acquired on the job. In fields where higher cognitive skills are required, such as surgeons and airline pilots, there is a need for decision making skills and the kind of knowledge that is generally not taught in the classroom. In these situations, the interactive effects of the required tasks produce a novel situation requiring unique knowledge beyond minor modification to instructed knowledge. Given the emphasis on performance in dynamic contexts, these knowledge requirements are referred to as adaptive knowledge or adaptive expertise. Together with declarative and procedural knowledge, a complete framework is created for job knowledge requirements.

CTA describes a set of methods for decomposing job and task performance requirements into discrete, measurable units, with added emphasis on eliciting mental processes and knowledge content. This is very different from

conventional task analysis because CTA provides methods for identifying the mental aspects of the job.

CTA is particularly well suited to training and development activities because it directly addresses the knowledge requirements of the job. CTA can identify the decisions, judgments, and perceptions that contribute to optimal performance of a job, in addition to the facts, concepts, and procedures to complete the task. Applications for CTA include training, development, and performance review. Two main drivers for CTA are performance deficiencies including loss of property or serious accidents, and improvement goals for human resource applications.

The CTA process generally includes four phases: Planning, Knowledge Elicitation, Knowledge Representation, and Application Development.

Planning. Planning includes four elements. First, is determining the purpose. Second is the selection of appropriate methods. Third is to have a sampling plan to ensure that the representation of knowledge developed from the CTA is reliable, valid, and useful. Fourth is selection of experienced personnel (SMEs) given the fact that well-developed procedures are typically not readily available.

Knowledge Elicitation. There are numerous methods for eliciting knowledge which could involve a combination of techniques including:

Documentation Analysis

Observation

Survey Questionnaires

Interviews

Think-Aloud Protocols

Unstructured Group Interviews (e.g., Focus Groups and Brainstorming)

Structured Group Interviews (e.g., Delphi Technique)

Knowledge Representation. Provide an efficient summary of the knowledge elicitation results, organized in a format that is sufficient to begin the application development with. The format could be text-based using lists and tables, graphical charts, and modeling: data, computer simulation, or performance. The format selected will be determined based on the type and volume of data collected.

Application Development. The final step in the CTA process is to convert the knowledge representation into an application. The application could provide tests, scenarios and simulations, or a complete training application, depending on the initial purpose for the CTA, which was determined during the planning phase.

Distributed Cognition

Traditionally held views suggest that cognition exists only inside someone's head. Distributed cognition offers an alternative and indeed provides a new paradigm for considering all domains of cognitive phenomenon. Specifically, distributed cognition goes beyond the boundaries of a person to include environment, artifacts, social interactions, and culture. This evolution of thought, occurring in the late 1990's , coincided with the emergence of performance support systems. Performance support systems also extend the cognitive limits of the person to include a variety of enabling artifacts, environmental factors, and social/virtual interactions.

Distributed cognition can be traced to the studies/fields of cognition, anthropology, and cultural psychology. The concept of distributed cognition fits

into the cultural environment into which children are born, which contains the accumulated knowledge of prior generations. Additionally, there is growing acceptance within the constructivist view of human cognition in support of the hypothesis that cognitions are situated and distributed rather than tools and products of the mind, existing in a separate context.

Four principles emerge that organizations can use for knowledge acquisition and for turning knowledge into action with distributed cognition:

1. Cognition is mediated by tools.
2. The critical role of mediation in cognition means that cognition is rooted in the artificial.
3. Cognition is a social affair that involves delicate variations and shades of communication learning, and interpersonal interactions.
4. Functional systems (i.e., systems made up of the interaction between a person and a tool) profoundly extend what a person can do with a tool, versus without.

As part of the paradigm shift to distributed cognition, you begin to look for cognitive processes, wherever they occur, on the basis of the functional relationship of the elements that participate in the process. It's important to recognize that a process is not cognitive just because is happens in the brain. Conversely, a process isn't non-cognitive because it happens among the interactions of many brains.

Most people apply the concepts presented in distributed cognition in their daily lives. Each time they use a PDA, a spreadsheet, a database, or an EPSS, they are in fact extending their cognitive performance range beyond what is in their head. The distributed cognition approach provides a viable framework and

methodology for examining interactions between humans and performance support tools, with profound implications for the way people live, work, learn, and perform.

Instructional Technique

Instructional Theory

In her books and seminars, Ruth Clark provides four levels of learning architectures for structuring content, which I have used in my professional practice. These are summarized in the table below.

Architecture	**Features**	**Learning Assumptions**	**Examples**	**Best Used For**
Receptive	Delivery of content Page turn	Passive absorption of information	PowerPoint lecture	Building awareness Briefings
Directive	Short lessons Questions Feedback	Gradual building of knowledge chains	Programmed instruction Software training	Learners who are novice to content
Guided Discovery	Problem-centered lessons Inductive approach	Knowledge and skills	Problem-based learning Cognitive apprenticeships	Learners with some content knowledge Far-transfer tasks
Exploratory	Rich network of learning resources	Learner responsible for learning outcomes	Some internet courses	Far transfer and conceptual learning

Managing cognitive load has implications for each of the four architectures presented above. A receptive architecture carries a high risk of cognitive overload, because it involves a delivery of information over which the learners have no control of pacing and little or no overt practice opportunities to apply the knowledge gained.

The directive architecture is based on a behavioral model of learning and imposes a high degree of structure on lessons. As such, it imposes the least amount of cognitive load and would be most beneficial for novice learners.

The guided discovery architecture involves problem-centered learning in which learning is guided in the context of solving authentic problems. This architecture is likely to impose at least a moderate load on learners. The extent of the cognitive load can be managed by providing scaffolding.

The exploratory architecture leaves most instructional decisions to the learner. Thus, the learner is able to impose his or her own load management if and when it is needed during learning.

Examples

I have provided two addition examples of work I have completed for other courses I've completed at Wayne. The first is an example of applied cognitive task analysis, excerpted from my final project in IT 6110. The second example is a think tank or 'cracker barrel' discussion of EPSS, in which I integrated the principles discussed in distributed cognition. Both of these examples follow as appendix items.

Heuristics and Implications

I believe the implications of cognitive methods in performance improvement are only now beginning to be understood as we move away from a "one size fits all" approach to learning and performance at all levels.

I plan to continue my studies and research in this field. I am also intrigued by the field of learner sciences which has only recently become a part of my personal instructional philosophy.

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EXAMPLE 1: Task Analysis

Overview

The *Topic Analysis* technique has been selected because much of this instructional unit relies on defining and developing cognitive knowledge. The *Procedural Analysis* technique is less appropriate for this instruction since the required skills for options trading focus on analytics using a variety of inputs in order to make investment decisions, and less on the mechanics of executing a trade. *Critical Incident* analysis could potentially be applied to develop insights as to why some trades are profitable while others are not, however, that level of instruction is beyond the scope of the solution domain.

The Topic Analysis has been supplemented with an applied cognitive task analysis (ACTA) for eliciting critical cognitive elements from the SME's, consistent with the goals that have been identified. There are three component interview techniques used in concert to identify different aspects of cognitive skill according to Militello and Hutton (1998).

1. *Task Diagram* – used to provide an overview of the task by identifying the difficult cognitive elements, at a fairly high level of abstraction.
2. *Knowledge Audit* – identifies the ways in which the expertise is used and provides examples based on actual experience, using a set of pre-defined knowledge probes for the domain. The output of the knowledge audit is a summary table containing an inventory of required areas of expertise, cues and strategies, and an explanation of why the skill may be difficult or challenging to a novice.
3. *Simulation Interview* – can be used to deepen understanding by presenting a challenging scenario to the SME and documenting how they go about solving it. In trading stock options, the success measure is in being able to read the market to make an informed investment decision based on the information available and the experience of the trader. Examples will be provided in the instructional unit, however, individual strategies based upon investor experience are outside of the scope. Hence, the simulation interview technique has not been utilized for this project.

The knowledge audit table is used for validating the goals for the unit and formulating the instructional objectives.

Topic Analysis

The topic analysis follows a scheme for classifying information into six discreet categories: facts, concepts, principles/rules/procedures, interpersonal skills, and attitudes (Reigeluth, 1983).

I. Stock – tangible, part ownership in a company

   A. Equity shares in a company

B. Profit or loss is realized when you sell the stock or receive a dividend

C. Value as an asset

II. Option – intangible, control over a block of shares of in stock in a company

A. A Contract for an option is written for 100 shares of the stock

B. Call – right to purchase 100 shares of stock

C. Put – right to sell 100 shares of stock

D. When you purchase and option, you do not own the stock unless the option is 'exercised'

E. Strike price is the agreed upon purchase (Call) or sell (Put) price at which the option can be exercised prior to the expiration date

F. Expiration date is the third Saturday of the expiration month; defines the period during which an option may be exercised or traded

1. General rule is that trade has to be executed before the close of business on Friday immediately before the Saturday of expiration

G. Premium is the price that is paid to the seller to enter the contract

1. The premium is quoted as the price per share

2. Option's value is set by time and the market value of the stock

H. Valuation of an option

1. At the money is when the strike price is the same as the current price

2. In the money is when the option has intrinsic value (the strike price is below the market value for a call); if exercised, it will have some value

3. Out of the money is when the option has no intrinsic value (the strike price is above the market value for a call); the option has no value if exercised

4. Value = Time Value + Intrinsic Value

a. Time value is the portion of an option's current value, above intrinsic value; greatest when the expiration date is furthest away and declines as expiration approaches

b. Intrinsic value reflects the price difference between the stock's current market value and the strike price for the option

III. Reading the market for options

A. Forecast overall market direction

1. Dow Jones Industrial index of blue chip stocks
2. NASDAQ index of technical stocks
3. Volatility Indexes from BusinessWeek Investors Toolbox measure risk based on the standard deviation of the asset return—basically an indicator of investor fear
   a. (VIX.X) Volatility Index for S&P 500 at the Chicago Board Options Exchange
   b. (VXN.X) Volatility Index for the NASDAQ
   c. Tied to investor fear and uncertainty
      i. When the VIX/VXN is high, it's time to buy
      ii. When the VIX/VXN is low, it's time to go
   d. Volatility index is a contrarians indicator
4. Put-Call Ratio from Investors Business Daily
   a. Number puts vs. number of covered calls bought by options traders
      i. When options trader buys a put on a stock, he's betting price of stock will go down
      ii. When options trader buys a covered call, he's betting price of stock will go up
   b. When ratio is 1.0 or higher, it indicates 'bearish' sentiment, less than 1.0 indicates more 'bullish' sentiment

B. Market Posture

1. Trends of major market indexes

C. Technical Analysis

1. Check the trend and choose a strategy that takes advantage of current trend
2. Check the indicators to confirm the breakout or breakdown
3. Check for support and resistance

4. Confirm there is volume to support a breakout

IV. Options Trading

A. An Account with a Brokerage firm is required

1. Provides investor account with options trading privileges
2. Option trading account is subject to a different set of requirements than for stock trading

B. Options Clearing Corporation

1. Responsible for settlement of option contracts

C. There is always a ready market for the option at the current market price

V. Pricing Options using Options Table

A. Option Quotes Table

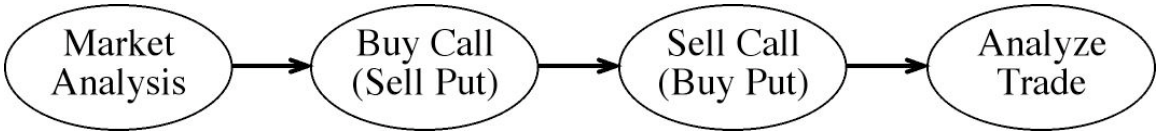
1. Option Root
2. Expiration Month
3. Strike Price
4. Option Trading Symbols

B. Free Daily Options Quotes

1. Harris*direct* at http://www.csfbdirect.com
2. Schwab at http://www.schwab.com

Applied Cognitive Task Analysis (ACTA)

Task Diagram



At a high level, each options trade always consists of two parts—buy and sell. There are only three possibilities for an option and they are:

- Trade
- Exercise
- Let it expire

Knowledge Audit

Knowledge Audit Probes – Questions posed to SME

♦ Diagnosing and Application
What are the types of situations where investors should look to options and what special skills should they possess?

♦ Market Awareness
What are the key indicators for reading the market in general for option investment opportunities, and how do you pick a stock to take out an option on?

♦ Perceptual Skills
Taking a look at the range of options that may be available for a stock, what are the cues to look for when evaluating an option, based on the individual's risk tolerance and investment goals?

♦ Tools and Techniques
Do you use any guides or pre-determined criteria to know when to take your profit or cut your losses on an option trade…do you have any tools to assist with this?

- Monitoring

  Once you're in an option trade, how often do you need to check on the option and underlying stock (e.g., hourly, daily, weekly, etc.) to ensure that performance is in-line with expectations?

Knowledge Audit Table – Completed working with SME

Aspects of Expertise	Cues and Strategies	Why difficult?
Diagnosing and Application Begin with the recognition that options are not for every investor and can serve different needs depending on the circumstances—the place to start is with creating a strategy.	Use options (calls) to create leverage by increasing profit margins with a smaller investment. Use options (puts) to provide insurance against loss on stocks you own. Use options (covered calls) to generate additional revenue on stocks you own.	Novice needs to understand investing basics with special attention paid to options (*Characteristics and Risks of Standardized Options*). A broker for options trading must approve investors, requires an amended agreement, since options carry a risk of 100% loss on an investment.
Market Awareness Options provide a short-term investment strategy that is effective in Bull and Bear markets.	Look at the trend to see where the major market indexes are headed short-term, intermediate, and long-term.	Novices look at an individual stock but miss the big picture…stocks tend to follow the major market indexes. The trend affects the types of plays likely to be successful. Remember, "the trend is your friend", don't try to buck the trend.
Perceptual Skills In the steps below, the key elements to consider with an option (puts and calls) are the strike price and the expiration date, which determine the premium.	A conservative or novice investor might go one contract above the in-the-money strike price, while a more aggressive investor may go one contract lower.	It's importance to recognize that the option premium consists of time value as well as intrinsic value. For a buyer, time value tends to work against them.
Tools and Techniques A systemic approach can be applied for purchasing either a call or a put.	Steps for Buying an Option: 1) Pick a stock to play 2) Check the stock chart 3) Choose an expiration date 4) Choose a strike price 5) Plan your exit 6) Place your order 7) Monitor your position	The biggest problem faced by novices is they don't have good stocks to begin with.
Monitoring Options are by nature very dynamic, and can change dramatically over the span of just a few hours. Before entering an order to buy an option, you need to first determine when to exit.	Determine a price target for the stock by looking at the chart. Exits should be tied to overhead resistance or underlying support. Pick a percentage gain on the option as an exit target.	Novices tend to react to good news, or bad, with emotion. When a position is losing money, emotions often cloud your judgment and lead to a bad decision.

What is an EPSS?

> *EPSS is defined as "an integrated electronic environment that is available to and easily accessible by each employee and is structured to provide immediate, individualized on-line access to the full range of information, software, guidance, advice and assistance, data, images, tools, and assessment and monitoring systems to permit job performance with minimal support and intervention by others."*

Source: Gloria Gery, Electronic Performance Support Systems, published in 1991.

Additional Resources:

- http://www.epsscentral.info (an EPSS about EPSS)
- EPSS Revisited: A Lifecycle for Developing Performance-Centered Systems (ISPI 2003)
- Michael Allen's Guide to e-Learning (Wiley 2003)
  - Authorware
  - Macromedia
  - Allen Interactive

Application

EPSS may provide an economical and timely alternative for performance improvement and support when training is not warranted, or practical, such as with new hires, a temporary job rotation or completing a task that is performed infrequently.

Under these circumstances, the benefits of an EPSS may include:

- Ability for employees to rotate into different positions on demand as workloads change from season to season, day to day, or even hour to hour
- Enabling new hires can become instantly productive
- Reduction or elimination of errors caused by memory lapses, poor habits, and distractions
- Infrequently performed tasks can be performed with the same level of thoroughness and competency as frequent tasks

Application (cont.)

Choose EPSS When…	**Choose Interactive Instructional Intervention (e.g., eLearning, Instructor led, Blended solution) When…**
The task or job changes often.	The tasks are relatively stable.
Staff turnover is high	Workers hold same responsibilities for a long time
Performers do not need to know why each task step is important and whether it is appropriate in a specific circumstance	Performers need to evaluate the appropriateness of each step and vigilantly monitor whether the process as a whole continues to be appropriate
Tasks are systematic but complex and difficult to learn or remember	Tasks may require unique, resourceful, and imaginative approaches
Tasks are performed infrequently	Tasks are performed frequently
Tasks allow time for performance support	Tasks are time critical and prohibit consulting a performance guide
Supervision of employees on the job is limited or unavailable	Supervision is expensive or impractical
Mistakes in performance are costly	Mistakes are easily rectified
Learners are motivated to seek a solution	Learners don't appreciate the value of good performance

Support Levels (see PST)

The three support levels—Intrinsic, Extrinsic, External—are taken from Gery in the context of support for software applications. The concepts can be applied to all EPSS whether or not the task is directly connected to a computer software application.

Intrinsic Support

Performance support that is integrated into the interface, content, and behavior of the application logic. User assistance for completing the task is so tightly integrated with the interface that it appears to be part of the system.

Extrinsic Support

Performance support that is integrated with the application, but is not the primary workspace. User assistance that is available within the system, but

requires the user to break the task flow to obtain it. Summoning online help is a common example.

External Support

Support for performance and learning that is external to and not integrated with the computer-mediated workspace. User assistance that requires the user to break the work context entirely, such as looking up something in a book, attending a training session, or making a call to a help desk.

Attributes for Assessing EPSS (see PST)

Gery describes nineteen attributes which can be used for assessment in evaluation or design of an EPSS. The Website referenced above (http:/www.epsscentral.info) provides a job aid for scoring each attribute, to construct a mathematical average and obtain a quantitative assessment of how performance centered the software is.

A summary of the attributes is as follows.

- The first four attributes reflect some task sequencing.
- Items 5-8 describe things that appear on the display (or alternate display).
- Items 9-12 describe what is presented as a function of user or system action.
- Attributes 13-18 describe system behavior, options and underlying functionality, but they also describe what appears in the interface as well.
- Item 19 specifies consistency with conformance to standards in designing graphical environments

Further Distinction between Learning and Performance Support

EPSS is about improving performance. The point-of-performance interface, which delivers the precise amount and type of support at precisely the right time, is the performance support (PS) system.

Conversely, any activity that begins and ends with putting things into people's heads rather than with directly improving their performance is not PS. Focusing on learning or knowledge transfer rather than performance results in people who know what to do but never do it. This may also lead to training as a solution to problems for which it is inappropriate.

The goal of training is learning, with improved business performance an obscure assumption. With PS, performance is the goal. In a well-designed PS system, learning is likely, desirable, even inevitable, but it's not the point! Performance is the point.

Link between EPSS and Distributed Cognition Theory

Cognitive theory is based on knowledge transfer occurring inside a person's head between working memory and long term memory. Corresponding learning theory suggests that we learn new material best, by connecting with something we already know. Furthermore, working memory has limitations with regard to the number of things we can keep track of at any given moment, presumably 7 plus or minus two. Working memory available in our heads is further taxed by extraneous cognitive load caused by noise or distraction in the design of the learning materials.

The basic idea of distributed cognition is that cognition does not occur as an isolated event that takes place inside one's head. Rather, cognition is a distributed phenomenon that extends beyond the boundaries of a person to include environment, artifacts, social interactions, and culture. This theory is consistent with the constructivist view that human cognitions are situated and distributed rather than decontextualized tools and products of the mind.

From the perspective of distributed cognition, four principles emerge which support EPSS.

1. Cognition is mediated by tools
2. The critical role of mediation in cognition means that cognition is rooted in the artificial
3. Cognition is a social affair that involves delicate variations and shades of communication learning, and interpersonal interactions
4. Functional systems (i.e., systems made up of the interaction between a person and a tool) profoundly extend what a person can do with a tool, versus without