DEVELOPING AN ANDRAGOGY MODEL FOR IS/IT EDUCATION

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ABSTRACT

The existing pedagogy model that is used in much of formal education is argued to be inferior to a "mix" of pedagogy and andragogy on the basis of extant learning theories. A set of propositions, which may be thought of either as prescriptions or as the bases for hypotheses to be empirically tested, are derived from six principles that reflect the evolution of learning theories. A "portfolio" of educational m∴ʰodologies is presented to illustrate how the andragogy model can complement the pedagogy model in IS/IT education.

IS/IT practitioners are prototypical of those for whom the half-life of ideas, systems and solutions is ever declining. Much that is learned during their formal education rapidly becomes obsolete (Dansereau, 1978). Since many IS/IT academic programs adopt a "teaching" perspective rather than a "learning" perspective, there appears to be systemic deficiencies in current educational practices that exacerbate these problems of obsolescence. Academics are certainly aware of this issue (Ireland *et al.*, 1993). Some of them (e.g. Ives & Rubin, 1993; Trauth et al., 1993) have attempted to address it in discipline-specific contexts, but little attention has been given to the learning needs of people who operate in the IS/IT context, to assessments of the basic assumptions underlying current IS/IT pedagogy, and to developing new practical models of IS/IT education that are based on extant learning theories.

THE LEARNING NEEDS OF IS/IT PRACTITIONERS

Much is known, or can be reliably projected, about the changing demands that are being faced by post-industrial organizations (Davidow and Malone, 1992; Drucker, 1993; Huber, 1984). Central to these changing demands is the dramatically increased volume and significance of information and knowledge that results from increasingly turbulent environments and the increased pace of

business activities. IS/IT practitioners in these organizations must create technology-enabled processes that facilitate sophisticated decision-making and rapid innovation. Decision making and innovation in these organizations will not emphasize "uniform procedures, objective measures of performance, and center/periphery systems of control," but rather "flexible procedures, differentiated responses, qualitative appreciation of complex processes, and decentralized responsibility for judgement and action" (Schön, 1983: 338). A model of formal education which is better suited to these new organizational environments than is the current model of IS/IT education could reduce the dissonance between formal education and the needs of the workplace (Davenport & Prusak, 1998).

ANDRAGOGY VERSUS PEDAGOGY

One such educational model that may better meet the needs of modern IS/IT practitioners is that of andragogy. The andragogy model for education is antithetical to the traditional pedagogical model. "Pedagogy," derived from Greek *paid-* (meaning "child") and *agogos* (meaning "leading") means the art and science of teaching children. *Andragogy*, derived from Greek *andr-* meaning man, implies "the art of science of helping adults learn" (Knowles, 1984: 6). The two models are based on different assumptions about the role of learners

and the role of educators in the education process. Table 1 shows the differences between the pedagogy and andragogy models (based on Knowles, 1984: 1-21) in terms of the concept of the learner, the role of the learner's experience, and the learner's readiness, orientation and motivation. Generally, the andragogy model assumes more of the learner and places more responsibility for learning on the learner than on the teacher.

Clearly, a wholesale adoption of the andragogy paradigm presumes a mature adult learner—an assumption that might not be valid at the undergraduate level. Therefore, the argument made here may be taken to apply primarily to the graduate level where most students are more experienced and more mature. At all levels, some "mix" of andragogy and pedagogy is undoubtedly the practical solution. However, since much of formal education is based on the pedagogy model, educators should assess andragogy for the benefits that it can bring at both the graduate and undergraduate levels.

THEORETICAL BASES FOR A NEW APPROACH TO IS/IT EDUCATION

Knowledge about evolving human learning theories must be understood and addressed if an effective new paradigm for IS education is to be developed. Learning theories focus on learning as a process. A framework suggested by Merriam and Caffarella (1991: 121-139) is helpful in comparing various theories, their assumptions about the nature of learning and the relative effectiveness of various strategies for enhancing learning. This framework identifies four broad "orientations" to learning: behaviorist, cognitivist, humanist, and social learning. Table 2 summarizes the key ideas of these four orientations and those ideas that may be adopted from each to develop a new learning paradigm for IS/IT.

TABLE 1
CONTRASTING THE ASSUMPTIONS:
PEDAGOGY VERSUS ANDRAGOGY
(BASED ON KNOWLES, 1984)

	PEDAGOGY	ANDRAGOGY
The Concept of the Learner	Learner is dependent on the teacher who decides what should be learned, how and when it should be learned, and whether it has been learned	Learner is self-directing. In fact, the psychological definition of 'adult' is "One who has arrived at a self-concept of being responsible for one's own life, of being self-directing."
The Role of the Learner's Experience	Learners enter the educational activity with little prior experience that is of much value as a resource for learning.	The volume and quality of the learner's experience is increasingly a source of their self-identity and is a rich resource for learning.
The Learner's Readiness to Learn	Readiness is a function of age and advancement to the next grade level.	Readiness to learn is a function of a need to know or do something in order to perform effectively in some aspect of their lives.
The Learner's Orientation to Learning	Subject-centered orientation to learning; learning as a process of acquiring prescribed subject matter content.	Life-centered, task-centered, or problem-centered orientation to learning. Importance of organizing learning experiences (the curriculum) around life situations rather than according to subject matter units.
The Learner's Motivation to Learn	Motivation from external pressures from parents and teachers, competition for grades, the consequence of failure, etc.	Internal motivators—self-esteem, recognition, better quality of life, greater self-confidence, etc. are more potent than external motivators.

TABLE 2
LEARNING ORIENTATIONS

	Key Ideas	Representative References	Applicability to IS Andrological Education
Behaviorist	• Focus on behavior as product of learning • Stimulus-response (SR) with stimuli from environment • Law of effect • Law of readiness • Frequency • Recency • Drive • Expectancy • Cognition	Guthrie 1939, 1940; Hull, 1943; Skinner, 1938; Thorndike, 1965; Watson, 1930; Tolman, 1967	• Readiness of student to excel. • "Drive" related to the degree to which student can take advantage of andragogy • Cognition requires that students learn about environment and develop a cogni-tive map
Gestalt (cognitive)	• Learning as a cog-nitive phenomenon • Focus on "wholes," or gestalts	Bode, 1929; Hergenhahn, 1988; Piaget, 1970	• Focus on complex realities. • Student "comes to see" cognitively after exploring alternatives • Information process approaches to learning
Humanist	• Human growth and development • Behavior as a conse-quence of human choice • Self actualization	Knowles, 1980; Merriam and Caffarella, 1991; Maslow, 1970	• Self directedness of adults in pursuing learning • Value of experience in learning
Social Learning	• Focus on social setting in which learning occurs • Learning from obser-vation • Visualization of conse-quences • Attention-retention-rehearsal-motivation cycle	Bandura, 1986; Hergenhahn, 1988	• Importance of social groups in learning • Use of vicarious bases for observing other people, their behavior and conse-quences

APPLYING THE LEARNING THEORIES TO IS/IT EDUCATION

The behaviorist view of learning is directly applicable to repetitive situations in which there is not much variation in the response required by the environment. Clearly, the post-industrial organization requires a wide range of differentiated responses to stimuli. Nonetheless, the behaviorist orientation is important because it underlies much of current educational practice in which the educator's role is to design an environment that evokes desired behavior and which suppresses undesired

behavior. From this behaviorist foundation emanate practices such as the systematic design of instruction, behavioral objectives, the concept of the instructor's accountability for learning, programmed instruction, competency-based education, etc. (Merriam and Caffarella, 1991: 128). Vocational and skills training in which the learning activity is broken down into several tasks with each task having one 'correct response' is also based on this orientation (Cross 1981: 233). Since some amount of skills training is appropriate in IS/IT education—such as learning representative software—a wholesale rejection of this view is not warranted. However, it is more appropriate at lower levels of education than at levels at which learners are preparing to enter real-world organizations.

The Gestalt view is more directly appropriate to the post-industrial context in its focus on the individual as the locus of control over learning. This suggests that individuals must be the focus of learning, with organizational systems enabling improved or faster learning by individuals. The Gestalt emphasis on "wholes" [such as complex realities and integrated process-technology contexts] rather then "parts" [such as abstract models or specific software or technologies] suggests the appropriate design of contexts for addressing learning needs.

The humanistic approach contributes to a new learning approach through Maslow's (1970) view of motivation in terms of "self-actualization." Self-actualization represents a person's desire to be all that he or she is capable of becoming. The motivation to learn is intrinsic to the learner, and self-actualization is the primary goal of learning. If an organization is to operate successfully, the "organization" (i.e., its systems, procedures, etc.) cannot be responsible for learning; the self-actualization basis of individual motivation is essential.

The social learning perspective, with its accounting for the learner, the behavior and the environment, can also contribute to better IS/IT education. The notions that the individual's behavior is a function of an environmental interaction and that behavior influences the environment can be considered to be a central precept of the learning organization (Bandura, 1986; Senge, 1990; King, 1996).

PRINCIPLES FOR A NEW MODEL FOR IS/IT EDUCATION

The foundation for a new model of IS education may be summed up in six principles:

- replacing the learning assumptions of pedagogy with the assumptions of andragogy,
- incorporating the interplay between the environment of "practice" and that of "theory and research" into formal education,
- developing a learning approach that cycles between complex reality and abstraction,
- adopting a holistic viewpoint rather than multiple compartmentalized foci,
- focusing on critical thinking skills and "information & knowledge literacy,"
- focusing on "learning how to learn."

The Assumptions of Andragogy

Knowles' (1980, 1984) andragogy model of learning views the learner as a "mutual partner" in diagnosing learning needs, formulating objectives, designing a pattern of learning experiences and evaluating results. This model suggests that the learning group should be small enough so that all participants are involved in planning all phases of the learning activity. The primary role of the educator is that of a facilitator and coordinator of the learning process. In contrast, in learning modes that are primarily educator-directed, teachers display the *products* of their own learning skills in the form of "arguments and interpretations they present in lectures and discussions." In learner-directed modes, educators share the"...process by which... [they] interrogate texts, compare different interpretations of phenomena... or discover patterns in seemingly chaotic evidence" (Kurfiss, 1988: 3-4).

The Interplay Between Management Practice and Management Theory and Research

There are two important "knowledge environments" within which IS/IT education exists and of which IS/IT educators must be continuously cognizant. These environments are "practice" and "theory and research." Practice reflects the body of knowledge that has been accumulated based on the experience of practitioners. This knowledge is embedded in the minds of individuals and in business processes and practice. Its artifacts are "best practice" repositories, practitioner-authored management books, benchmarking studies, practitioner journal articles and other forms of explicit knowledge into which previously-tacit practitioner knowledge has been transformed. Theory and research is knowledge that is developed through the creation and testing of theories and through empirical research. It is made available in textbooks and as articles in research journals.

The interaction between practice and theory and research is of great importance in IS/IT education. Practice incorporates the results of research and theory just as theories are developed, modified and tested based on the results achieved by practitioners (Drucker, 1994). This interplay between the two environments must be incorporated into IS/IT education if only because it exists in the real-world in which students will need to operate. However, this interplay has also been argued to be the most effective way of educating professionals (Trauth et. al., 1993). If IS/IT education were to be conducted in isolation from these two interacting environments, it would be sterile and ineffective.

The Complexity-Abstraction Cycle

Despite the pervasive view that regards "managing complexity" (Schön, 1983: 141) as the scarce skill in post-industrial organizations, most pedagogical approaches initially focus on abstractions of reality. The assumption is that reality is too complex to be the focus of attention, so that one must first understand abstract models and their application to "nominal" problems before one is prepared to cope with the complexity of real-world problems.

There is ample evidence that an approach which *first* introduces problems and issues in the context of complex reality, *then* proceeds through abstraction, and *then* seeks to apply abstract solutions to complex reality is superior to one which begins with abstractions which, in practice, may ignore or de-emphasize the complexities of real-world implementation (Diggory, 1972; Jantsch, 1973). An initial focus on the exploration of complex realistic issues, problems or situations can provide the motivation for learning as well as the context for identifying relevant theories, abstract models, and datasets. Ausubel (1967: 222) suggests that learning is meaningful only when it can be related to concepts which already exist in a person's cognitive structure; new knowledge is processed by the learner "only to the extent that more inclusive and appropriately relevant concepts are already available in the cognitive structure to serve a subsuming role or to provide definitional anchorage."

A learning approach that cycles from complexity [to provide a familiar context and a motivation to learn], to abstraction [to afford study of the theories, models and data that may be useful], and back to complexity [to modify the abstractions in the light of real-world complexity and implementation issues] is also based on the idea that "a kind of knowing is inherent in intelligent action" (Schön, 1983: 50). Schön emphasized the significance of "reflection-in-action" as "central to the art

by which practitioners sometimes deal with situations of uncertainty, instability, uniqueness, and value conflict." Such a process is characterized by thinking about what is being done, how well it is working and how it fits in the 'bigger scheme of things;" while assessing why it is being done and what other alternatives are possible. Underscoring the intimate relationship between learning and action, Argyris (1993) offers three reasons for this linkage: (a) the context-sensitive nature of learning, (b) the dynamically changing nature of the contexts, and (c) the formulation of policies and routines [based on previous learning] to guide further action. As observed by Schön (1983: 338), "Reflection-in-action tends to surface not only the assumptions and techniques but the values and purposes embedded in organizational knowledge."

A Holistic Viewpoint Versus Multiple Compartmentalized Foci

Ackoff (1979) suggests that "Managers are not confronted with problems that are independent of each other, but with dynamic situations that consist of changing problems that interact with each other...managers do not solve problems: they manage messes." Churchman (1994) criticizes the discipline-bound focus that is endemic to most curricula by observing that "the current division of human knowledge into disciplines in managerially 'stupid' and 'blocks off' inquiry into critical issues because the issues don't fit into the disciplines."

Learning may be potentially enhanced if it is conducted, at least in part, in terms of a holistic approach that allows for interdisciplinary analysis and for the application of models and theories from various disciplines. This is complementary to the previous point dealing with the complexity-abstraction cycle in that introducing issues that are reflective of the real-world motivates learners to consider options rather than prematurely "homing in" on the theory or approach that is provided by a single discipline. Learners that do not find the available theories and techniques to be adequate to deal with an issue will be motivated to search for new options rather than to distort the issue to fit the 'tools' that are currently available to them.

Senge (1990) describes the process of holistic thinking as 'the art of seeing the forest *and* the trees'. He suggests that the art of systems thinking lies in seeing *through* complexity to the underlying structures generating change. Rather than ignoring complexity, the emphasis of this approach is on organizing complexity into a 'coherent story' to illuminate the causes of problems and

developing enduring remedies to such problems. Learning may be enhanced through this approach even in contexts that are much simpler than those pertaining to complex issues. This appears to be the case even in learning new software or computer applications:

> One cannot understand a technology without having a functional understanding of how it is used. Furthermore, that understanding must incorporate a holistic view of the network of technologies and activities into which it fits, rather then treating the technological devices in isolation (Winograd and Flores, 1986).

Critical Thinking and Information Literacy

Critical thinking applies to "...questions that cannot be answered definitely and for which all the relevant information may not be available." It is "...an investigation whose purpose is to explore a situation, phenomenon, question or problem to arrive at a hypothesis or conclusion about it that integrates all available information..." (Kurfiss, 1988: 1-2). Critical thinking has two general components: reflective and analytical. The reflective component is characterized by the process of "reflection-in-action;" the analytical component underscores the ability to do very complex reasoning by thinking from diverse perspectives.

Critical thinking may be contrasted with rote learning in the role played by factual information or knowledge. Rote learning focuses on knowledge of facts, whereas critical thinking de-emphasizes facts and instead accentuates "information and knowledge literacy"—the ability to recognize an information or knowledge need and then to locate, evaluate and effectively use the needed information/knowledge.

Despite the close relationship between information literacy and information resources such as computerized systems, our current easy access to information may sometimes represent a double-edged sword. As a byproduct of the easy availability of information, practitioners may encounter the problem of too much information rather than too little information. Often, the challenge lies in being able to identify "what is important and what is not important, what variables to focus on and which to pay less attention to..." (Senge, 1990: 128). Underscoring the relationship between information literacy and lifetime learning, the American Library Association Presidential Committee on Information Literacy observed that:

> Ultimately, information-literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. They are people prepared for lifelong learning, because they can always find the information needed for any task or decision at hand (1989).

Learning How to Learn

Bruner (1965) and Gagne and Briggs (1979) merged learning theory with theories of instruction to unite what is known about learning with the best way to facilitate its occurrence. Bruner (1965) emphasizes learning through discovery which he defines as: "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence so reassembled to additional new insights." Gagne and Briggs (1979) have linked the acquisition and processing of knowledge in terms of the "learning how to learn" concept, which has been defined by Smith (1982) as involving, "possessing or acquiring, the knowledge and skill to learn effectively in whatever learning situation one encounters."

Riegel (1973, 1976), Kramer (1983), and Labouvie-Vief (1980), have proposed types of thought processes that may operate in concert with (or be more advanced than) the formal system of logical thought proposed by Piaget (1970). Two themes from this work are the dialectic and relativistic nature of thought. Dialectic thought explains the contradictory nature of human thought and action. Whereas "formal operational thinking" involves the effort to find fundamental fixed realities—"basic elements and immutable laws"—dialectical thinking "attempts to describe fundamental processes of change and the dynamic relationships through which change occurs" (Basseches, 1984). Relativistic thought implies a shift from viewing knowledge in dualistic terms [as either right or wrong] to an acceptance of the notion that the context of knowledge is as important as the knowledge itself.

Within the broad spectrum of the transition from Piaget's (1970) formal logical thought to more complex notions of learning, the learner's perception of the role of the instructor changes from authority figure to that of expert and guide. Learners at the "higher end" of the continuum view knowledge in a contextual sense, search for relationships between ideas and view instructors as facilitators of this process.

OPERATIONALIZING
THE ANDRAGOGY MODEL

This perception of the educator-learner relationship can be operationalized using Rogers' (1983) notion that significant learning leading to personal development has five characteristics.

1. Personal involvement—the affective and the cognitive aspects of a person should be involved in the learning event.

2. Self-initiated—a sense of discovery must come from within.

3. Pervasive—the learning makes a difference in the behavior, the attitudes, perhaps even the personality, of the learner.

4. Evaluated by the learner—the learner can best determine whether the experience is meeting a need.

5. Essence is meaning—when experiential learning takes place, its meaning to the learner becomes incorporated into the total experience.

The challenge in operationalizing an educational model based on these principles may be thought of as one of designing a "learning society" in which "there is a natural tendency for people to learn and ...(in which)...learning will flourish if nourishing, encouraging environments are provided" (Cross, 1981:229).

Propositions for Operationalizing the Andragogy Model

Various approaches have been created and used in IS/IT to meet some of the requirements of the andragogy learning paradigm. These approaches are based on the premise that the closer learners are to the real-life situations, the more likely it is that they will develop the abilities needed outside the classroom (Marsick, 1990: 244). The value of such 'experiential' learning lies in its providing learners with "freedom to make judgements, and responsibility for the consequences of choice and action" (Marienau and Chickering, 1982). They are also based on the general premise that experience plays a significant role in learning and can facilitate the ability to learn in a self-directed fashion:

> This is encouraged by the opportunity to see real consequences of one's actions, to feel the exhilaration of success as well as the frustration of failure...adults can develop functional skills

and attitudes necessary for effective adult life. These include skills of interpersonal interaction, group processing, intracultural communication, coping with ambiguity...or judgement in complex situations." (Gilley, 1990: 261).

Based on Rogers' (1983) characteristics, a number of propositions for improved IS/IT learning have been identified. These propositions may be taken to be prescriptive, but they may also serve as the bases for developing testable hypotheses for those who desire to do research concerning IS/IT learning.

• Theory and practice must interact in any effective learning context. Theory is understood best in the context of practice and practice can only be truly understood in relationship to theory (Raelin, 1993).

• IS/IT students must understand technology, business, and their interactions (Bongiorno,1993). This was identified as the most important human resource issue of the 1990s in a survey of senior business managers (Mallach, 1989).

• Cross-functional interdisciplinary learning experiences, environmental contexts and analytical frameworks are superior to simple abstract unidimensional approaches (Emmett, 1992; Reeve, 1992).

• There is a need for the active involvement of students in issue and problem formulation rather than merely in problem solving. The formulation of problems and issues and the generation of alternatives is an inherently creative process while problem solution is primarily an analytic one. Many educational programs have tended to focus on the left half of the brain, which is analytic and processes information in a serial fashion, and to focus less on the right side, which is holistic and processes information in a parallel fashion (Runge, 1994).

• "Action learning" that deals with complex real issues (Prideaux, 1992; Wills, 1993) can effectively complement more traditional classroom approaches.

• There is a need to "break loose" from the neoclassical economics paradigm to incorporate "things that are not easy to measure" such as quality, customer satisfaction, and employee morale into the thinking of students (Kaplan & Norton, 1996; Lataif, 1992).

- The process of learning is at least as important as the substance that is taught. "The answer is for business schools to worry less about what is taught and more about how they teach" (Economist, 1991; 13-14).

- Oral and written communication skills should be made a routine part of everyday learning (Gross, 1993; Currid,1993; Down & Liedtka, 1994).

Illustrative Learning Methods

Learning methodologies that have proved to be useful for beginning to operationalize the andragogy model based on these propositions are described below. (All of these methods have been used by one or both of the authors). A 'portfolio' of such approaches might constitute a way to begin an experiment with the andragogy model for IS/IT education.

1. Self-organizing self-directed teams
2. Multidisciplinary team projects in industry
3. Focused monitored internships in industry
4. Scenario planning
5. Issue analysis
6. Strategic assumption analysis
7. Computerized simulations
8. Non-computerized simulations
9. Complex interactive cases
10. Knowledge management systems
11. Student-led courses

Self-Organizing Self-Directed Teams. In the MBA-MS in MIS "double degree" program at the Katz Graduate School of Business at the University of Pittsburgh, entering students are given a four-day intensive workshop related to teams, teamwork and team-building. The workshop includes having the students organize into temporary teams on several occasions to experience the benefits and costs of various approaches. Then, at the end of the workshop, they organize themselves into 12-person teams that will remain intact for nearly a year. The teams must decide how they will operate and organize their work in a variety of projects that they are assigned in various required courses. Each team member receives the team grade in these projects. Some teams decide to pursue other functions and activities as well—study groups, social events, team projects in non-team oriented courses, etc. Each team also sends a representative to serve on a central body that meets with various faculty to assess problems and progress as well as to exchange information concerning "best practices" among teams. In this way, teams can learn from the experience of others, thus facilitating sharing of ideas across various groups and individuals. The result is a

learning experience that varies greatly from team to team, since a small proportion of teams have great difficulty, while some truly become 'learning organizations.' Although this team-based approach is relatively new and only partially evaluated, it is believed to be a major contributor to student learning (Kilmann, 1996).

Multidisciplinary Team Projects in Industry. Various schools have used multidisciplinary team projects as devices for operationalizing some of the precepts of andragogy. Real-world problems are assigned by business firms and teams are selected from among volunteer students. In this instance, teams are typically neither totally self-organizing, nor totally self-directed. As such, this team project method fits nicely with the self-organizing teams discussed above, since it serves to give the students a range of different team experiences. Typically, instructors first assess a real-world project or problem and then organize multidisciplinary teams to reflect the mix of skills and backgrounds that appear to be needed in order to address it. Instructors review progress with teams, sit in on project reports to the sponsoring firms and generally act as advisors to the team about both content and process issues. Generally, these projects constitute a course or course element for which a grade is given. The grade is usually based on the instructor's assessment of individual and team performance as well as on the client-company's evaluation of the project. These project courses are generally considered to be valuable by everyone, but of course, their use must be limited and focused. Typically, many more students volunteer than can be utilized.

Focused Monitored Internships in Industry. Internships are 3-4 month periods that individual students spend in industry. Although, the term is widely applied to "summer jobs" undertaken in the midst of a degree program, here we refer to highly-focused closely-monitored projects that are conducted by individual students in a business setting for academic credit. A faculty advisor provides guidance and advice and maintains contact with the client firm. This sort of internship is much like a thesis project since it requires the formulation and solution of a real-world problem as well as the production of oral and written reports on the project. The context of these reports must include identification of the "academic" material that was considered and/or used—tools, techniques, theories, concepts, etc.—as well as an evaluation of their applicability, relevance and utility.

Scenario Planning. In scenario planning, students, working in teams, create scenarios for assessing alternative paths for the evolution of a situation, a

technology, or a contemplated action—for example, a company going into a new business or expanding internationally in its current business (Bloom & Menefee, 1994; Tenaglia & Noonan, 1992). A scenario is "…a script-like characterization of a possible future presented in considerable detail, with special emphasis on causal connections, internal consistency and concreteness" (Schoemaker, 1991: 549-550). Scenarios are widely used in business planning to describe a range of alternative paths for the evolution of a complex interacting set of factors. Often, four scenarios are employed to depict the dynamics of the evolutionary paths, but as few as two—a "best" and "worst" case—can be useful to portray the reasonable range of uncertainty that may be associated with an activity of interest. The purpose of scenarios is to depict reasonable alternative paths under various assumptions concerning the factors that may influence the development of the focal activity, the relative importance of various factors, the reactions of various stakeholders who can influence its development, the major uncertainties that are involved, and the concepts, data, analyses, frameworks and theories that may be useful.

Issue Analysis. The focus of issue analysis is neither a validated theory, which academics would often prefer to be the basis for learning, nor a currently useful practice, which the practitioner would often prefer. Rather, "an issue is an evolving state, the reality and importance of which is widely accepted, but whose specific manifestations and timing are subject to dispute by reasonable people" (King, 1982). For instance, an issue might be "the impact of new information technologies on society in the new millennium." Everyone realizes that this impact will be significant, but the specifics of how changes will evolve, which areas they will impact, what other changes they will induce, etc., are open to argument. Using scenarios, the evaluation of such issues can be usefully explored without the need to predict the specific technological innovations that may drive change.

Strategic Assumption Analysis. SAA was introduced by Mitroff, et al. (1979) as an extension of Dialectic Inquiry (DI), which is based on the assumption that the pace of business often forces managers to make decisions before all desired data can be collected (Churchman, 1971; Mason, 1969). DI is an adversarial problem-forming methodology which is especially suited to treating ill-structured and/or difficult-to-define issues. Participants in an SAA exercise establish at least two very different (antithetical) and maximally challenging views so that everything that one view takes for granted as a basic and reasonable assumption, the other intensely challenges. The intent is to assist the participants in

understanding of the role of underlying assumptions in the problem definition (Mulligan, et al., 1996).

Computerized Simulations. Simulations have been developed to enable the participants to gain decision-making experience in a risk-free environment. Business simulation games allow for learning in various areas, ranging from goal setting, to strategy formulation to decision making. They also facilitate the learning of various abstract models and analytical techniques in an interactive, collaborative, quick-feedback, risk-neutral environment (Faria & Dickinson, 1994). With increasing use of multimedia technologies that can integrate text, graphics, video and sound, these games are now being created as self-contained comprehensive vehicles needing little or no instructor intervention (Ives and Jarvenpaa, 1996).

Non-Computerized Simulations. In simulations of this variety, enabling and supportive computer software may be used, but a simulated "world" does not exist within the computer. Rather, students are asked to pursue goals, perform tasks, etc. while communicating with other individuals and teams using software such as Lotus Notes. Instructors establish the simulated situation and guide and control the evaluation of the process by providing suggestions and responding to needs for theories, concepts, or techniques as they arise through references, lectures, written materials or demonstrations. Help may be provided in the form of "hints" if specific useful data are not requested. In this way, experiential learning is complemented with traditional delivery of information and knowledge.

Complex Interactive Cases. Cases have been used in business education for decades. However, complex interactive cases entail more data than could ever be useful in addressing a situation. As such, they simulate the real world of infinite irrelevant data and test the students information literacy—the ability to identify, find and use relevant data, theories and models. Some multimedia cases have been developed which allow students to be active participants in the data collection process. For example, to select individuals to be "interviewed" and to see and hear video clips of their views on various subjects—as well as to seek data in other forms (Upton & Seet, 1997). This process simulates the task of a consultant who enters an organization and must speak with various individuals, gather data and otherwise seek information in order to identify a problem or diagnose a situation. The major differences between these cases and traditional ones is: (a) the wealth of available data (b) their interactive nature and (c) the fact that data are not presented as a predefined

whole; rather students must use information literacy skills to identify data that may be relevant.

Knowledge Management Systems. Knowledge management (KM) systems have potential for use in IS/IT education. The "core" of knowledge management focuses on the explication, capture and dissemination of tacit knowledge that exists in the minds of people or which is embedded in organizational processes (King, 1999). While such systems are primarily developed in business contexts, experiments are underway for creating them in educational situations. Knowledge may then be transferred from advanced students to novice students as well as from faculty to students. An "organizational memory" may be created for the ever-changing body of students who are enrolled in a particular program. Students might thereby use the KM system to access knowledge generated by students who have graduated and moved on to other organizations as well as knowledge created by still-active students with whom they are not directly involved.

Student-Led Courses. Some courses may be offered in a manner in which groups of students play the traditional role of the instructor in that they make the presentations of course topics. Student groups are challenged to perform sufficient research to deliver a lecture on a topic. The instructor plays the role of advisor and facilitator. Other students are encouraged to ask questions and to give their own views on the topic. The instructor can also ask questions, give his/her point of view and summarize at the end of the discussion period. This approach may not work well in highly-technical areas. However, in courses dealing with topics of which people are widely aware, but which they have not thoroughly studied—such as the learning organization, quality, continuous improvement, etc.—this approach can be valuable in eliciting diverse viewpoints and in clarifying different prior perceptions.

EVALUATING PEDAGOGY AND ANDRAGOGY

While many business schools have adopted student teams in one or more of the formats described above, generally this has been done to directly meet the wishes of industry where such skills are in great demand. Unfortunately, this variety of motivation may make teamwork merely part of the "content" of management education. It can be argued that businesses implicitly understand that teamwork leads to improved learning and to the creation of learning organizations, so that teamwork is not just a fad currently being promoted in business firms. However, the elements of teams and teamwork that are treated here are not merely responses to the requirements of business firms. Rather, teams and teamwork are consequences of the application of learning theories, so that whether or not teams remain in favor in business, the value of teams in education will continue.

Many skeptics who are devoted to the traditional "sage on a stage" teaching approach, evaluate the approaches described above as emphasizing process over content. As a result, they tend to believe that there is so much content that needs to be mastered that such emphasis on process results in an inefficient learning experience. Andragogy approaches do emphasize process to a greater degree than do traditional methods, and in some ways they may be relatively inefficient. One is not assured to be mastering specific explicit knowledge when a complex situation is being assessed and a problem is being formulated and solved. Such a process may be inefficient, especially as compared to the traditional approach of studying the abstractions which form knowledge structures and for which testing and evaluation can be readily performed. However, it can be argued that since one can never transmit sufficient knowledge, trade-offs between processes aimed at "learning how to learn' versus the transmission of incremental factual knowledge will always favor the andragogy approach. Of course, this has not been empirically verified, so that there is a real need to comparatively evaluate traditional learning approaches versus those of andragogy.

The primary issues to be dealt with in comparing the two approaches are:

i. Are students motivated to learn to a greater degree through the andragogy approach?
ii. If so, do they therefore learn more efficiently?
iii. Does the andragogy approach produce more effective learning, i.e., greater scope, greater depth, etc.?
iv. Do any benefits offset the losses of efficiency that may result from spending time at the beginning of the process in experiencing complex reality domains?
v. How does retention and the ability to apply knowledge in new unfamiliar situations compare for the two approaches?
vi. How can the best "mix" of pedagogy and andragogy be designed for groups of students who may not be appropriately experienced/mature for a "pure" andralogical approach?

Until each of these questions is empirically addressed, some will continue to be skeptical about andragogy. However, evidence is being amassed as education

inexorably moves from pedagogy to andragogy, sometimes without recognizing that it is doing so. If those who are experimenting with various new methods will seize the opportunity to make comparative evaluations, the validity of these theories and approaches can be tested.

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