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## **Learning Styles and Multiple Intelligences in Distributed Learning/IMS Projects**

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New methods to deliver education at a distance are rapidly emerging. One of the most promising is the Instructional Management System (IMS). It is based on international standards, sponsored by EDUCAUSE, is entirely Web based and supports distributed learning. This is the first-generation system that changes instructional design to move into learning objects, and Internet learning environments in a sustainable non-linear way. A number of top firms are developing software applications to support IMS. One of the brightest spots is that IMS provides the pathway to easily prepare and present materials to the student's multiple intelligences and learning styles. It truly provides the software to easily individualize education and training materials for the learner.

### **The Instructional Management System**

The IMS system has as its basic element that learning materials can be broken down to their simplest elements. Think of a learning object as a chunk of learning content. It would likely never be the entire program or module. A group of learning objects would make up a program or module. Developers talk about the granularity of the learning object – how small it can be.

Learning objects can take the form of any type of media that can be digitized and sent across the Internet. This opens up a wide range of materials to the instructional designer – video, print, textbooks, magazines, slides, QuickTime movies, case studies, collaborative activities, e-mail, Web pages, telephone, and any other medium that has yet to be developed. Each learning object will have a meta-data tag that defines its properties. For example, the meta-data tag would contain the name of the learning object, the creator, type of file, interactivity of the content, grade level, cost, copyright information, and appropriateness for types of learning styles in addition to other information that the author may provide.

The meta-data tagging system becomes a sophisticated search tool that will significantly increase our abilities to quickly find materials on the Internet. Large libraries of materials will be available to search.

## **IMS Advantages**

There are a number of advantages to the IMS system.

**Cost-effective:** Previously produced materials can be repurposed and reused by any number of users. Rather than producing new basic content with limited production funding, IMS will provide access and use of existing materials to meet a variety of students' learning styles. When existing materials cannot be used or are not appropriate for some reason, production funding can be used to produce the new content objects. The new content objects can also be offered through the IMS libraries and sold to other users, thus involving others in the production and reducing the cost per student to produce the content. Reusable and new content objects can be combined easily in the same program.

**IMS Libraries:** Searchable and viewable libraries of content materials will be collected. The meta-data tag will be the method used for the search. All types of materials for all grade levels and training needs will be found in the libraries. Medical, defense, industrial, K-12, and higher education content will be available. The libraries may also contain full programs and modules which can be bought or leased according to the producer's wishes.

**Multiple Software Platforms:** A number of companies are developing software that will support the IMS system. The software will continue to work on the meta-data tagging system.

**Based on International Standards:** The IMS system is based on internationally accepted standards which are sponsored by the IEEE (an international engineering group), EDUCAUSE, and a other organizations. The standards have also been accepted by the IMS Developers' Group which is composed of a large number of software companies which are developing the software to support the standards. Members of this group include IBM, Apple, Oracle, Asymetrix and other major companies. A number of prominent universities are also members of the group.

**Individualize Materials for Students:** While materials can be individualized for classes whose students have the full range of learning styles and intelligences, the material can also be personalized for students with fewer skills, smaller foundations of content knowledge, looped classes where two grades of students are mixed, and other non-traditional educational scenarios. Materials can be selected in a way so that the needs of students can be met who are ahead or behind the rest of the class.

**Web Based:** While the materials will be available through the Web IMS libraries, and IMS software will be Web based, students will be able to directly access lessons on the Internet or through a LAN server at their school or work. Materials could also be downloaded and saved to one computer in the classroom.

**Promotes Self-Directed and Collaborative Learning:** While the IMS system will track the students' progress through the material, it will also promote self-directed learning and inquiry learning if the instructional designer includes activities to do this. The right activities will also promote collaborative learning as students work on projects together through the IMS software provided by vendors.

**Promotes the Use of Facilitated Learning by Faculty:** While the faculty can be instrumental in preparing the lessons for students, when students work through the lessons, the faculty of necessity moves into the realm of facilitating learning. This is an important feature for educational institutions that have struggled with the integration of technology into the classroom and curriculum.

## **New Methods to Meet New Learning Needs**

For hundreds of years, most teachers and trainers have presented information to learners in one format—lecture to a whole class. That model has been identified as objectivist and is based on Skinner's behaviorist learning theories where the teacher sets the pace, selects the textbook and resources, and controls the classroom. As students, we sat in the seats and have been the target of those seeds broadcast by the objectivist theories of learning and the linguistic teaching style. This is the teacher centered learning model, The hope was that the seed would fall upon fertile ground, germinate, and prosper.

For any organization teaching this way, recent research has shown that many learners not only prefer, but need, non-lecture styles to efficiently and effectively learn. They need styles with relevant interpersonal interaction, significant hands-on opportunities, well executed visual-spatial content, and with more self-direction of the pace and path of learning for each style of delivery. This is called constructivist at the K-12 level, and Andragogy at the adult level. In this model, the instructor facilitates the learning, identifies potential resources, and encourages the students to set their own rules, goals, and objectives. Learning contracts may be used to set the scope of work and assignments rather than a typical syllabus. This model is student/learner centered.

## **Gardner's Multiple Intelligences**

The theory of multiple intelligences (MI) was first described by Howard Gardner in *Frames of Mind* (1983). Howard Gardner is Professor of Education at Harvard University and holds research appointments at the Boston Veteran's Administration Medical Center and Boston University School of Medicine. Gardner defines intelligence as "an ability or set of abilities that allow a person to solve a problem or fashion a product that is valued in one or more cultures". His most current research indicates that there are eight distinct forms of intelligence: linguistic, logical-mathematical, spatial, kinesthetic, musical, interpersonal, intrapersonal, and the naturalist. Gardner suggests that different intelligences may be independent abilities--a person can be low in one domain area but high in another domain. All of us possess the intelligences but in varying degrees of strength and skill.

Intelligence Quotient (IQ) theory (based solely on the linguistic and logical-mathematical intelligences) assumes that a person's intellectual potential is a fixed, genetically determined trait, which can be measured early in life and will determine an individual's potential. Gardner's above definition suggests a broad view of cognitive functioning and is in sharp contrast to intelligence as defined by IQ. In other words, Gardner's MI model broadens our perceptions of what is meant to be intelligent. Until Gardner's arrival, this model of intelligence was perceived as the norm throughout most of the world. In short, the theory of multiple intelligences continues to open the minds of educators, psychologists, learners and parents as to how learning and education can be changed so that all persons may be guided to achieve their maximum potential.

It is tempting to equate learning styles and intelligences because there are similarities, but until we have a much better understanding of both, it is best to avoid mixing the models.

**Linguistic Intelligence** - using words effectively. These learners have highly developed auditory skills and often think in words. They like reading, playing word games, making up poetry or stories. They can be taught by encouraging them to say and see words or to read books together. Tools include computers, games, multimedia, books, tape recorders, and lecture.

**Logical-Mathematical Intelligence** - reasoning, calculating. Think conceptually, abstractly and are able to see and explore patterns and relationships. They like to experiment, solve puzzles, ask cosmic questions. They can be taught through logic games, investigations, and mysteries. They need to learn and form concepts before they can deal with details.

**Visual-Spatial Intelligence** - think in terms of physical space, as do architects and sailors. They are very aware of their environment. They like to draw, do jigsaw puzzles, read maps, daydream. They can be taught through drawings, verbal and physical imagery. Tools include models, graphics, charts, photographs, drawings, 3-D modeling, video, videoconferencing, television, multimedia, texts with pictures/charts/graphs.

**Musical Intelligence** - show sensitivity to rhythm and sound. They love music, but they are also sensitive to sounds in their environments. They may study better with music in the background. They can be taught by turning lessons into lyrics, speaking rhythmically, tapping out time. Tools include musical instruments, music, radio, stereo, CD-ROM, multimedia.

**Bodily-Kinesthetic Intelligence** - use the body effectively, like a dancer or a surgeon. Keen sense of body awareness. They like movement, making things, touching. They communicate well through body language and can be taught through physical activity, hands-on learning, acting out, role playing. Tools include equipment and real objects.

**Intrapersonal Intelligence** - understanding one's own interests, goals. These learners tend to shy away from others. They're in tune with their inner feelings; they have wisdom, intuition and motivation, as well as a strong will, confidence and opinions. They can be taught through independent study and introspection. Tools include books, creative materials, diaries, privacy and time. They are the most independent of the learners.

**Interpersonal Intelligence** - understanding, interacting with others. These students learn through interaction. They have many friends, empathy for others, street smarts. They can be taught through group activities, seminars, and dialogues. Tools include the telephone, audio conferencing, time and attention from the instructor, video conferencing, writing, computer conferencing, E-mail.

**Naturalist Intelligence** - demonstrates expertise in the recognition and classification of numerous species – the flora and fauna – of the environment. Value is placed on these individuals who can recognize members of a species that are especially valuable or notably dangerous and can appropriately categorize new and unfamiliar organisms. These abilities come into play more probably with respect to “artificial” items. Discrimination by a teenager with regard to sneakers, cars, sound systems, or CDs also fits the intelligence.

To help the categorization process:

- |   |  |
|---|--|
| • Verbal/Linguistic plays with words        | • Bodily/Kinesthetic plays with moving |
| • Logical/Mathematical plays with questions | • Interpersonal plays with socializing |
| • Visual/Spatial plays with pictures        | • Intrapersonal plays alone            |
| • Musical/Rhythmic plays with music         | • Naturalist plays with categories     |

### **Canfield Learning Styles**

Everyone has multiple learning styles. Dr. Albert A. Canfield created a learning styles inventory as most people do not know what their best learning styles are or that their styles differ from others. There is no one right or best learning style. Our styles of learning, if accommodated, can result in improved attitudes toward learning and an increase in productivity, academic achievement, and creativity. We use some styles when learning, but we tend to prefer a small number of instructional methods. Furthermore, evidence indicates that an individual can learn better, smarter, faster and retain more information when material is presented in one's preferred learning style/multiple intelligence. However, research does not support that there will be one right method to teach to a student.

Humans learn in a variety of ways and it is likely that there are ways that have yet to be discovered along with the instructional methods to meet them. Presenting information to students in only one learning style does not meet all of the student's needs. For example, a student might have roughly the same preference for learning content through visual and hands-on materials. If the content is presented only to the visual preference, the student would not learn as completely as he/she would if the content was presented through hands-on methods. Since all students learn differently due to a dominant or preferred learning style.

The Canfield LS instrument is easy to use and self-scoring. It provides students with knowledge about their individual learning styles and how they differ from others. The instrument is paper based and takes about 30 minutes to complete. It can be submitted before the class begins or the institution may keep the learning styles of all students on record and make them available to instructors. The instrument helps determine preferred learning conditions, areas of interests, modes of learning, and course expectations.

## Conditions

**Peer:** Working in teams; good relations with others; having friends; feeling positive about working and building something together. Clearly a high priority in an organization: Work logically and clearly organized; meaningful assignments and sequence of activities.

**Goal Setting:** Setting one's own objectives; using feedback to modify goals and procedures; making one's own decisions on objectives. This is an important element of being self-directed and proactive. They need to know how they fit in with the larger company goal.

**Competition:** Desiring comparison with others; needing to know how one is doing in relations to others. America fosters this - but competing does not automatically foster excellence. Competition is an extrinsic reward ... it is better replaced with an intrinsic reward system.

**Instructor:** Knowing the instructor personally; having mutual understanding; liking one another. Give plenty of eye contact and positive non-verbals.

**Detail:** Specific information on assignments, requirements, rules, etc. People who want minimal amounts of detail are right brain conceptual thinkers. They need to understand the concept first ... and then will sit through the detailed explanation - remembering only the details that are important to their conceptual understanding. People who want details in a sequential order are left brain linear thinkers. Take them through the process in an orderly, chronological process.

**Independence:** Working alone and independently; determining one's own study plan; doing things for oneself.

**Authority:** Desiring discipline and maintenance of order; having informed and knowledgeable instructors and superiors.

## Content

**Numeric:** Working with numbers and logic; computing; solving mathematical problems; etc. Provide with charts, spreadsheets.

**Qualitative:** Working with words or language; writing, editing, talking. Provide a report to them prior to a meeting or the need to make a decision. Lengthy question and answer periods will give them time to formulate the idea in their own words

**Inanimate:** Working with things; building, repairing, designing, operating. Provide a physical model or way to work with the idea in question

**People:** Working with people; interviewing, counseling, selling, helping.

## Mode

**Listening:** Hearing information; lectures, tapes, and speeches.

**Reading:** Examining the written word; reading texts, and pamphlet.

**Iconic:** Viewing illustrations, movies, slides, pictures, and graphs.

**Direct Experience:** Handling or performing; shop, laboratory, field trips, practice exercises, and hands-on.

**Expectancy Score:** The predicted level of performance.

## Variance in One Class

It is quite useful to show a class all of the scores from the inventory as it helps them to understand that everyone learns differently and that no one way of learning is best (See Table 1). This also helps instructors to think about the class mix of learning styles and how to begin creating activities and assignments that will meet a variety of styles. It also provides support for instructional designers who need to learn new ways to design instruction for classes with multiple learning styles and intelligences. Figures are shown in percentiles so that a score of 95 would indicate the 95<sup>th</sup> percentile and the learner would have a high need to have this style met. A score of 05 would indicate the fifth percentile – or a low need for the learner.

The Canfield is quite useful in distributed learning as it shows scores for an instructor to provide structure, the independence level of the student, and the need for an authority figure by the student. For example, if the student instructor percentile score is 25, this indicates a low need for an instructor to provide structure; 85 would indicate a much higher need by the student to have structure imposed from the outside.

If the student's independence score is high, such as an 85 or 95, it indicates that the student is quite independent in learning and probably capable of working well in a distributed learning environment. A low score would indicate that the student is not an independent, self-directed learner and that the instructor will need to provide an intervention to help the student begin movement toward this goal. Students need time to move through the process of becoming independent learners. This may take six months to a year.

environment and collaborate well with other students. If the figure is high, they require an authority figure to provide the structure and set the rules. The instructor will need to provide an intervention that will the student's reduction of the need for authority imposed from the outside.

These three scores are quite useful as indicators for the distributed learning instructor of students who will do well in the environment, and those who will need interventions to begin their movement toward self-directed learning. Interestingly, it is always a temptation to want to help the needy student and provide the structure and authority that they often demand in an instructor. However, these demands are usually another indication that the student is unable to be self-directed and independent in their learning.

**Table 1: Sample Class Learning Style Scores** (All Figures are Percentiles)

<b>Student</b>	<b>#1</b>	<b>#2</b>	<b>#3</b>	<b>#4</b>	<b>#5</b>	<b>#6</b>
<b>Conditions</b>						
Peer	65	75	88	82	47	47
Organization	20	60	30	99	99	82
Goals	45	52	35	12	15	03
Competition	75	07	37	37	05	10
Instructor	25	83	38	94	10	65
Detail	17	53	45	65	99	90
Independence	88	55	57	45	01	40
Authority	65	10	65	18	08	10
<b>Content</b>						
Numeric	72	72	52	53	22	90
Qualitative	30	40	90	60	30	30
Inanimate	30	12	55	20	90	90
People	52	62	95	14	71	05
<b>Mode</b>						
Listening	25	80	73	65	12	95
Reading	55	63	40	60	90	47
Iconic	25	25	07	80	01	08
<b>Direct</b>						
<b>Experience</b>	88	25	87	10	98	10
<b>Expectancy</b>	97	95	75	60	59	89

Table two shows the preferred learning style of the population by percent and age. Observe that the linguistic Intelligence increases with age according to Teele's research while the bodily-kinesthetic intelligence shows a reduction.

**Table 2: Teachers' Dominant Intelligences by Age** (1995, Teele)

<b>Ages:</b>	<b>20-25</b>	<b>26-35</b>	<b>36-45</b>	<b>46-55</b>	<b>56+</b>
Linguistic	3.51	3.94	4.22	4.58	4.37
Logical-Mathematical	3.07	3.13	3.06	3.26	3.41
Spatial	4.33	4.34	4.37	4.21	4.15
Musical	3.17	3.36	3.33	3.38	3.33
Bodily-Kinesthetic	4.85	4.40	4.21	3.90	4.11
Intrapersonal	3.13	3.37	3.52	3.69	3.40
Interpersonal	5.80	5.43	5.27	4.95	5.08

### **Litzinger & Osif Theory of Learning Styles**

Litzinger & Osif (1992, 73) chose to look at learning styles in a different light and describe learning styles as "the different ways in which children and adults think and learn." They see that each of us develops a preferred and consistent set of behaviors or approaches to learning. They break the learning process into three segments:

1. Cognition--how one acquires knowledge
2. Conceptualization--how one processes information. There are those who are always looking for connections among unrelated events. For others, each event triggers a multitude of new ideas.
3. Affective--people's motivation, decision making styles, values and emotional preferences will also help to define their learning styles.

## **Kolb's Theory of Learning Styles**

A number of people have tried to "catalogue" the ranges of learning styles in more detail than this. Kolb is perhaps one of the best known. Kolb showed that learning styles could be seen on a continuum running from:

1. Concrete experience: being involved in a new experience
2. Reflective observation: watching others or developing observations about own experience
3. Abstract conceptualization: creating theories to explain observations
4. Active experimentation: using theories to solve problems, make decisions

Hartman (1995) took Kolb's learning styles and gave examples of how one might teach to each style:

1. Concrete experienter--offer laboratories, field work, observations or trigger films
2. Reflective observer--use logs, journals or brainstorming
3. Abstract conceptualizer--lectures, papers and analogies work well
4. Active experimenter--offer simulations, case studies and homework

Although Kolb thought of these learning styles as a continuum that one moves through over time, usually people come to prefer, and rely on, one style above the others. And it is these main styles of which instructors need to be aware when creating instructional materials.

## **Implications for Instruction**

Where do these lists of learning styles lead us? There are probably as many ways to "teach" as there are to learn. People do not see, hear, or experience the world in the same way. They have very different preferences for how, when, where and how often to learn.

Using multiple types of media (video, audio, data) ensures that all learning styles are met and that significant methods for interaction are provided. This mix of media is available now. With it all learning styles can be reached. It also includes a component that enables students to become self-directed learners and reduce their sense of isolation.

The synergy of technologies available through multiple media and the Internet creates new learning opportunities for adapting learning to learning styles. Annual growth in web-based training, as projected by International Data Corporation, is to be 150 percent per year through the end of the century, as compared to eight percent per year for instructor led training. Unfortunately, this effective use of technology is not happening. Of the 23 sites offering interactive web-based training from software/hardware developers or training developers (such as Microsoft, Ziff Davis, Gartner Group, and Digital Think), none of those providers personalizes training or education by preferred learning style, nor was that criteria even contemplated as a quality measure in the research (Kisa Harris, ED Journal, March 1998). We have arrived at a place where we need to rethink and reinvent how we use learning styles and multiple intelligences to teach effectively using technology.

Most assessments are pencil and paper based and as such are not authentic assessments. They do not assess the learner in the act of doing something, but instead ask the learner to make a choice about what they might do in a given situation. This is not ideal.

## **Personal Learning Model (PLM) and Profile (PLP)**

**The Problem:** Students learn in a variety of ways. Technology and mediated courses can meet these needs better, however, there is currently no authentic assessment tool that works in an online environment. There is currently no model or tool capable of assessing a student's learning styles, multiple intelligences and media preferences.

The creation of a theory, model and tool will have a profound effect on the adoption of mediated courses because of its interactive, diagnostic, and multiple use components.

**The Personal Learning Model and Profile:** The Education Coalition, a nonprofit technology consulting group, in partnership with Performance Learning Systems, a for-profit corporation specializing in assessing student performance, has developed and tested the concept for a *Personal Learning Model* to assess the learning styles, multiple intelligences and media preferences of distance learners. The assessment is called the Personal Learning Profile (PLP) which is in development.

**Priority Need:** The PLM/PLP can be used by any distance educator seeking to develop online courses prescriptive to the needs of different types of distance learners. The PLP assessment tool can be taken anytime or anywhere by a student and will capture their learning needs and create a Personal Learning Profile. The assessment results and the personal profile of the student will be sent directly to the instructor for review and to the instructional management system of the organization for the learner's portfolio. This entire process will occur online in a virtual reality environment.

**Instrumentation Strategy:** The partnership is developing an online environment capable of assessing a student's learning styles, multiple intelligences and media preferences. It is an authentic assessment as compared to the paper/pencil assessments currently in use. The student will be tracked while moving through multiple tasks developed to specifically assess learning preferences, with results provided to the student and the instructor.

The Personal Learning Model has been developed based upon the learning styles research of Canfield and Gardner's multiple intelligences work. It also draws heavily upon the work of TEC in the application of these academic theories and practices to the use of media for instructional purposes and student media preferences.

The basis of the model is that technology provides a deeper learning experience for students if content materials are presented in their preferred style first, then in his/her second and third styles. Mediated learning materials assist students in learning more quickly and are more engaging for them than traditional delivery methods. The importance of the model is that it will provide individualized learning, although several dozen or hundred distance learners might be enrolled in the same online course. The Personal Learning Profile, generated by the model, will enable educators to plan effectively and modify curriculum and assignments to contend with each student's individual learning style differences.

Using learning styles for courseware design is gaining national attention and has become a "significant movement" in the training industry (Advanced Distributed Learning Initiative, 1997). Software programs to manage instruction are being developed and marketed by a number of leading vendors and will be deployed throughout educational institutions across the country. Yet none are being developed to assess the student's learning preference, which would make the online courses more effective. The Personal Learning Model fills this void.

The Personal Learning Profile is the application that will provide the assessment results for the student and instructor. After the assessment, the student's preferences will be embodied in a meta-data tag which will always be sent to the instructional management system when the student logs on. In response, the Instructional Management System will create an individualized Web page to deliver materials and content to the student in the student's primary, secondary, and third learning preferences. No other program is being developed to do this, although such a tool is crucial to the next generation of technology for distance learners.



**Regional and national consequences of a successful project.** Adoption of the Personal Learning Model/Profile are innovative ways for regional and national post secondary institutions to leverage the monies already invested in distance education by delivering prescriptive learning applications.

**Goal:** To develop fully interactive, high quality asynchronous courseware for anytime, anywhere assessment of a student's learning/intelligences style strengths and place it on the Internet for use by distance learners and distance educators.

**Objective 1:** Create one Personal Learning Model assessment tool which will assess at a minimum three types of learning styles and the learning modality of students in six areas: visual, auditory, math/logic, musical, interpersonal, and intrapersonal.

**Objective 2:** Build into the Personal Learning Model one kinesthetic and tactile assessment component through software development and integration of virtual reality and generate the beta version of the Personal Learning Profile.

**Objective 3:** Field-test the Personal Learning Model and Personal Learning Profile in a minimum of six distance learning environments including K-12, higher education, and training.

Problem	Solution	Anticipated Results
No existing software application that works in a learner-centered method, defines the student's personal learning model, and defines that model through dominant learning style, instructional media, and instructional methods.	Personal Learning Model and Personal Learning Profile for online use	Nationally accepted standardized distance learning assessment tool that is interactive, diagnostic, and suitable for multiple users that can be used anytime, anywhere by any distance learner. Qualitative measurement tool that will contribute to the improvement of online learning. Meets standards set by EDUCAUSE and the IMS Project (Instructional Management System)

The important thing is to recognize that not everybody is comfortable and productive within the same learning style mold. To engage and better instruct learners, one must first determine the individual's learning predominant and secondary learning styles, and then use technology to adapt learning to learning styles.

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