Designing Learning Objects to Personalize Learning

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If a student does not want to learn, she will not;

Regardless of the quality of the instruction offered her.

If a student wants to learn, she will find a way;

Regardless of the quality of the instruction offered her.

Introduction

The Web offers the perfect technology and environment for individualized learning because learners can be uniquely identified, content can be specifically personalized, and learner progress can be monitored, supported, and assessed. Technologically and technically, researchers are making progress toward realizing the personalized learning dream with adaptive learning object technology. However, two important considerations are being ignored or overlooked in accomplishing the personalization dream. One missing consideration concerns a whole-person understanding about key psychological sources that influence how individuals want and intend to learn online. Conventional, primarily cognitive solutions (which focus on how learners process, build, and store knowledge) offer a restricted view of how people learn and too often lead to unstable or ineffective online learning solutions. A more whole-person perspective includes emotions and intentions as critical factors in the learning process. Also missing is the integration of instructional purpose, values, and strategies into the design, development, and presentation of content (objects). Up to now, developments have focused on

technology rather than more important learner-centric issues.

To address these critical issues, this chapter introduces learning orientations. Learning orientations use the whole-person perspective (as an alternative to cognitive-rich theories) and recognize the impact of emotions and intentions on learning. Learning orientations offer strategies and guidelines for designing, developing, and using objects for personalized learning. To describe this perspective, this chapter will examine (a) the often overlooked dominant impact of emotions and intentions on learning, (b) critical human relationships between learning environments, key psychological factors (e.g., conative, affective, social, and cognitive) that influence learning, and (c) design guidelines for supportive learning solutions and environments that adapt to how people learn best. These insights suggest multiple ways to design objects that address how individuals learn, perform, and achieve differently.

This chapter is aimed at readers wanting new design perspectives for building objects that personalize instruction in adaptive learning environments. The purpose is to suggest that traditional approaches based on classroom practices are not always suitable for online learning. Missing from conventional approaches is the consideration of two important issues. The first is a comprehensive understanding about individual learning differences. Second, is the close integration of instructional value into the design of learning objects.

As we build and present objects for successful personalized learning, some designers are finding that conventional, primarily cognitive perspectives are flawed by a heavy emphasis on how individuals think (cognitive processes). These perspectives particularly lack adequate consideration of how people want or intend to learn online. Moreover, these explanations overlook the dominant impact of emotions, intentions, and social factors on learning. It is not enough to assume that if products are instructionally sound (from a cognitive perspective) and

technologically sophisticated, that they will be widely adopted and uniformly appreciated, managed, and utilized. The typical lack of attention to emotions, intentions, and social factors and over reliance on technology often result in instructional products that are not actually useful. For clarity, the author will call content objects *learning objects* only if the objects are used for instructional purposes, meaning that learning objects are content objects meaningfully presented to accomplish specific objectives related to learning. Additionally, they are designed using a conceptual framework embedded with instructional theory, strategies, and methodology. Otherwise, objects will be referred to as content objects.

The Whole-Person Perspective

The overall failure of many online instructional projects (e.g., low completion rates) highlights the important limitations of the typical cognitive approach. Web courses that lack adequate support for how people learn differently (from a whole-person perspective) end up being more informational than instructional. It is especially important to remember that in traditional settings instructors have been in the classroom managing emotions, intentions, social, and cognitive issues on an individual or group basis (some more effectively than others). Until the advent of online learning and rapidly changing requirements, it was seemingly enough to deliver primarily cognitive instructional solutions and rely on the instructor to deliver the personal approach. The reality is that many online learners (after years of instructor-managed learning) are simply not adequately prepared for self-managed online learning. Too many lack the self-motivation, intentions, independence, learning efficacy, or learning management skills to stay online learning continually and successfully. In a recent NCREL paper, Valdez and colleagues (2000) noted:

Berryman and others criticize American education for fostering inert knowledge, or

passive learning, that has been identified as structured upon behavioral principles" (Berryman, 1993; Besser, 1993; Popkewitz & Shutkin, 1993). Berryman (1993) defines passive learning thus:

> Passive learning means that learners do not interact with problems and content and thus do not receive the experiential feedback so key to learning. Students need chances to engage in choice, judgment, control processes, and problem formulation; they need chances to make mistakes (p. 375).

Berryman and others attribute passive learning practices to the system of industrial management in which each person's task is laid out carefully by the administrative powers. Each worker is told not only what to do but how to do it. Berryman claims that this industrial management style of education "places control over learning in the teacher's, not the learner's hands.

In order to design objects successfully, it will be necessary to account for the many factors that impede or facilitate learning. Secondly, it will be necessary to identify and match the theories, conceptual frameworks, processes, relationships, methodologies, treatments, and environments that best influence more successful learning for different types of learners. Incorporating these factors into object design is essential to the creation of instructionally sound learning solutions.

What theories, strategies, and methodologies support sophisticated online learning needs? Snow and Farr (1987) suggested that sound learning theories require a whole-person view that integrates cognitive, conative, and affective aspects, "otherwise, explanations about learning differences will be ambiguous and isolated from reality" (p. 1). According to Snow (1989), the

best instruction involves individualized treatments that differ in structure and completeness and high or low general ability measures. Highly structured treatments (e.g., high external control, explicit sequences and components) seem to help students with low ability but hinder those with high abilities (relative to low structure treatments). Bereiter and Scardamalia (1989) also suggested that learners in supportive environments have high levels of self-efficacy and self-motivation and use learning as a primary transformative force. Despite an increased interest in emotions, intentions, and personalized learning in the past two decades, most of today's researchers recognize cognitive factors as the dominant influence on learning and other key factors are relegated to a secondary role. This research typically alludes to or at best discusses aspects of conation and affect. Nevertheless, these personalized learning approaches remain largely dependent on dominant cognitive formulations.

Personalization

The Web offers an excellent environment for personalized learning, especially using objects. Personalized learning needs to use strategies that can address individual needs and promote individual success. It must also use technology to change the individual objects presented to each learner based on their individual needs. Personalization may take many forms as it adapts content, practice, feedback, or navigation to match individual progress and performance. For example, two individuals using the same instruction simultaneously may see two completely different sets of learning objects. The greatest benefit of learning personalization is the system's ability to make complex instruction easier by presenting only the specific information that a particular learner wants or needs in the appropriate manner and at the appropriate time. Another wonderful benefit of personalization is that each time you personalize, you learn and store a little more about a learner's unique set of needs.

Personalization Types

There are many ways to personalize learning. Nevertheless, like the terms learning styles and motivation, personalization is another ill-defined term. In order to be more specific, personalization is described here with five levels with increasing sophistication, each level describing a specific personalization strategy. From the simplest to most complex, the five strategies are: (a) name-recognized; (b) self-described; (c) segmented; (d) cognitive-based; and (e) whole-person-based. Each type has a specific purpose, influence, and resulting impact. These strategies can work separately but to be most effective they should work together to create a comprehensive or hybrid learning experience.

Name-Recognized Personalization – Name-recognized personalization is simple and easy to implement. This strategy is useful and powerful because most people value being acknowledged as an individual. For example, the learner's name can appear in the instruction or previous activities or accomplishments that have been collected and stored can later be presented when appropriate.

Self-Described Personalization - Self-described personalization enables learners, (using questionnaires, surveys, registration forms, and comments) to describe preferences and common attributes. For example, learners may take a pre-course quiz to identify existing skills, preferences, or past experiences. Afterwards, options and instructional experiences appear based on the learner-provided answers.

Segmented Personalization - Segmented personalization uses demographics, common attributes, or surveys to group or segment learning populations into smaller, identifiable and manageable groups. For example, learners that share a common job title, class, or work in a

certain department would receive content based on prescriptive rules that would support the learning and performance requirements for their segmented group.

Cognitive-Based Personalization - Cognitive-based personalization uses information about cognitive processes, strategies, and ability to deliver content specifically targeted to specific types (defined cognitively) of learners. For example, learners may choose to use an audio option because they prefer hearing text rather than reading it. Or, a learner may prefer the presentation of content in a linear fashion, rather than a unsequenced presentation with hyperlinks. This type of personalization operates on more complex algorithms than the previous types and is able to factor more learner attributes into each interaction. This strategy works by collecting data, monitoring learning activity, comparing activity with other learner behavior, and predicting what the user would like to do or see next.

Whole-Person Personalization -Whole-person personalization uses learning orientations. This strategy supports the complex set of deep-seated psychological sources (in addition to the conventional cognitive-based prescriptions) impacting differences in learning and performance. This personalization strategy makes predictions about delivering content from a whole-person perspective. It not only delivers content to help learners achieve learning objectives but it also attempts to improve overall learning ability and enhance online learning relationships. As the individual learns, the system also learns as it collects data, tracks progress, and compares responses and common patterns to improve responses (i.e., it becomes more precise over time). In its most sophisticated form, whole-person personalization requires real-time personalization using inferential technology to modify responses to a learner based on a dynamic learner model that is changing throughout the learning experience, when it occurs, just as it occurs.

Learning Orientations Theory

This chapter introduces Learning Orientations for personalized learning. The purpose is to provide the theoretical basis for personalizing learning based on a whole-person perspective that recognizes the dominant influence of emotions and intentions on learning. Cognitive factors play a secondary role, albeit still important role. Learning Orientations suggest that as individuals have different learning experiences and mature as learners, they gradually become more confident, sophisticated, and adept at understanding and managing an increasingly complex interplay of personally relevant affective, conative, social, and cognitive learning factors. Thus, the significant contrast in how individuals approach learning, their "learning orientation," lies in the unique, personal way that they understand, assess, and manage their learning to achieve or accomplish goals. For example, an understanding of the extent and depth of fundamental desires, values, and beliefs about why, when, and how to use learning and how it can accomplish personal goals or change events is fundamental to understanding how successfully an individual wants or intends to experience learning. Likewise, the degree to which designers understand learning orientations is the degree to which they can design objects for personalized learning.

Learning Orientations

Learning Orientations (1) highlight the influence of emotions, intentions, social, and cognitive factors on learning (how the brain supports learning), (2) identify and address the higher-order psychological dimension that can differentiate learning audiences, and (3) guide analysis, design, development, and evaluation of learning objects and environments. Learning orientations describe an individual's complex intrinsic managing and use of key psychological factors (to varying degrees) as they approach and experience learning. Learning orientations are not learning styles. The key distinction is that whereas learning styles recognize the dominant

influence of cognitive factors (and demote other factors to a secondary or no role), learning orientations recognize the dominant influence of emotions and intentions. This perspective reflects recent neurological research that provides evidence for the dominant influence of the brain's emotional center (Ledoux, 1996) on learning and memory. Highlighting the importance of intentions, Woodward (1998) also provides evidence describing the important use of goal orientation (intentions) for learning and development from an early age.

In Figure 1, the learning orientation construct describes three key learner-difference factors: (a) conative and affective learning focus, (b) committed strategic planning and learning effort, and (c) learning independence or autonomy. *Conative and Affective Learning Focus* describes the individual's will, commitment, intent, drive, or passion for improving, transforming, setting and achieving goals, and meeting challenges. *Committed Strategic Planning and Learning Effort* refers to the degree that learners plan and commit deliberate, strategic planning and effort to accomplish learning. *Learning Independence or Autonomy* refers to the individual's desire and ability to take responsibility, make choices, and control, self-assess, self-motivate, and manage or improve their learning. As shown in Figure 1, a number of factors (left column) play a role in determining an individual's orientation to learn. What is most notable about this model is the suggestion that emotions and intentions, not cognitive ability or technological superiority of an innovation, play the key role in determining learning success.

Learning Orientations present a comprehensive, human view that can be used as a framework for examining the dynamic flow (stimuli that activate emotions and stimulate responses for learning) between (a) deep-seated psychological learning factors (conative, affective, social, and cognitive), (b) past and future learning experiences, (c) choices and responses to treatments, and (d) learning and performance outcomes.

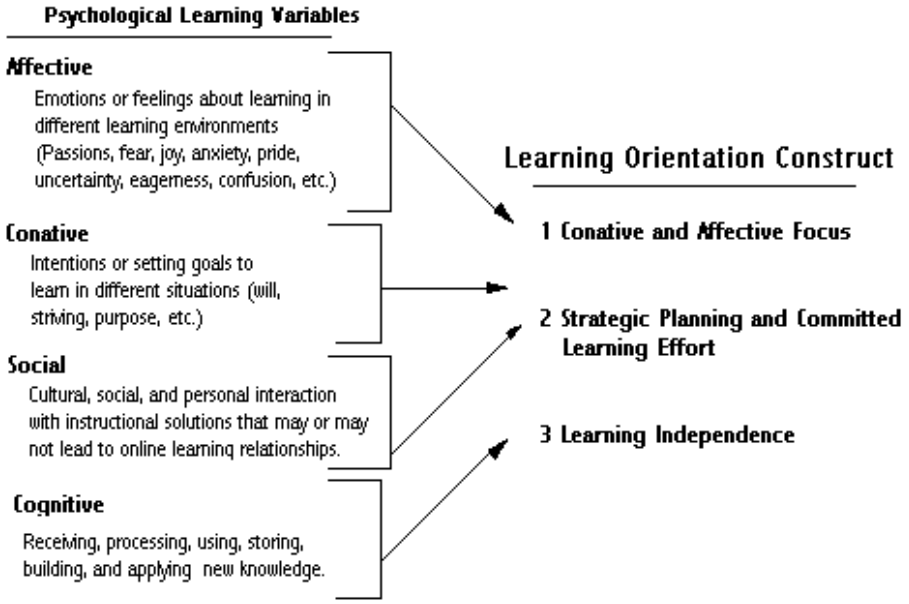

Figure 1. Three Construct Factors in the Learning Orientation Construct

The interplay between the deep-seated psychological sources of emotional reactions, learning differences, responses, and outcomes suggests that a complex conceptual structure exists with a qualitative order of influence. A clear definition of brain activity supporting this conceptual structure would explain or predict how learning orientation strongly influences outcomes in differentiated learning audiences. Figure 1 suggests that emotions and intentions (at the top of the hierarchy) stimulate responses that cultivate and manage subordinate differences in learning, such as preferences, styles, and abilities. In turn, emotional responses influence our cognitive assessments, choices, and use of cognitive strategies and skills.

Learning Orientations Model

The Learning Orientations Model (Table 1) describes four categories that broadly represent the existing diversity of learning orientations, enable us to explain key sources of learning differences, and describe specific strategies to mass customize learning (in terms of

instruction, assessment, and environments): *Transforming*, *Performing*, *Conforming*, and *Resistant* learners.

Transforming Learners are generally highly motivated, passionate, highly committed learners. They place great importance on learning and use it as an important intrinsic resource to bring about and manage change (innovate). They rely on their visionary, creative, holistic thinking, sophisticated learning, problem solving and strategic planning ability, and capacity to commit great effort and endure stressful challenges. They use independence, personal strengths, persistence, constant desire for challenges and exploration, high standards, learning efficacy, risk-taking, and positive expectations to self-motivate and self-direct learning successfully. However, these learners may become demotivated and bored, frustrated, or even resistant in environments or conditions that mismatch their assertive, exploratory, self-directed learning needs.

Contrasts: In contrast to other learning orientations, transforming learners know that they can plan and strategically commit great effort to accomplish important, long-term, transformational goals. They seldom solely rely on deadlines, structured environments, short-term projects, normative performance standards, expected social or instructional compliance, extrinsic rewards, or others for learning efficacy or self-motivation. Instead they rely on themselves or prefer mentoring relationships to learn and use learning as a valuable resource to innovate or transform.

Performing Learners are generally self-motivated in learning situations (task-oriented, project-oriented, hands-on applications) that interest them. Otherwise, they seek extrinsic rewards for accomplishing objectives that appear to have less value and perhaps require more effort then they are initially willing to commit. They may clearly acknowledge meeting only the

stated objectives, getting the grade, streamlining learning efforts, and avoiding exploratory steps beyond the requirements of the situation and learning task, commiserate with their degree of interest in the stated goal. They take some control and responsibility for their learning but often rely on others for motivation, goal setting, coaching, schedules, and direction. However, they may self-motivate and exert greater effort and excellence in situations that greatly interest or benefit them. They most often are detailed-oriented, lower risk, skilled learners that systematically and capably get the project done as they achieve average to above average learning objectives and tasks, according to their own personal goals. These learners lose motivation or may even get angry if too much effort is required and the rewards are not enough to compensate the perceived effort.

Contrasts: In contrast to transforming learners, performing learners are short-term, detail, task-oriented learners (less holistic or big-picture thinkers). They take fewer risks with challenging or difficult goals, commit less effort, focus on grades and rewards, and will cheerfully achieve less whenever standards are set below their capabilities. They are most comfortable with interpersonal, coaching relationships, and rely on or like external support, resources, and interaction to accomplish a task. In contrast to conforming learners, these learners have more sophisticated skills, commit greater effort to achieve higher standard goals, and prefer more sophisticated learning and performance environments with entertaining interaction that creates progressive effort, interest, competition, fun, and attainable goals.

Conforming Learners are generally more compliant and will passively accept knowledge, store it, and reproduce it to conform, complete routine or assigned tasks (if they can), and please others. They prefer learning in groups with explicit guidance and feedback. These learners do not typically think holistically, critically, or analytically, synthesize feedback, solve

complex problems, monitor and review progress independently, or accomplish challenging goals. They are typically less skilled, uncomfortable with decision-making, and may have little desire to control or manage their learning, take risks, or initiate change in their jobs or environment. Learning in open learning environments, which focus on high learner control, discovery or exploratory learning, complex problem solving, challenging goals, and inferential direction, may frustrate, demoralize, or demotivate these learners. They need scaffolded, structured solutions, guiding direction, simple problems, linear sequencing, and explicit feedback.

Contrasts: In contrast to other learning orientations, conforming learners learn best in well-structured, directive environments using explicit, step-by-step procedures. Unlike transforming and performing learners, who have stronger, more positive beliefs about learning and greater learning efficacy, these learners believe that learning is most useful when it helps them avoid risk and meet the basic requirements in their job. They are comfortable with minimum effort on simple goals that others set for them and help them achieve.

Resistant Learners lack a fundamental belief that academic learning and achievement can help them achieve personal goals or initiate positive change. Too often they have suffered repeated, long-term frustration from inappropriate learning situations. A series of unskilled, imperceptive instructors, unfortunate learning experiences, or missed opportunities have deterred resistant learners from enjoying and using learning to progress or improve. These learners do not believe in or use formal education or academic institutions as positive or enjoyable resources in their life.

Resistant learners are resistant for many reasons. Ironically, some resistant learners may actually be eager learners on their own outside of formal learning institutions. For example, they may be frustrated transforming learners who aggressively resisted the strictures of too structured

or restrictive goals and environments and chose to learn on their own, quite successfully. These learners may have learned to dislike school but they may also have learned how to succeed using their own strategies outside of school.

Contrasts: In contrast to other learning orientations, resistant learners focus their energy on resistance within the formal system, whether it is passive or aggressive. Their need to progress or improve lies in directions other than the established norm. Some with progress on their own, others will fall along the way.

Learning orientations are generalizable to all learning situations and are not domain or environment specific. However, despite a general learning orientation, individuals may situationally manage approaches to learning differently (not change learning orientation) in response to a topic, delivery method, environment, condition, or teacher. For example, a transforming learner may prefer learning more cautiously with less learner control if the topic is unfamiliar or complicated. However, once they reach their comfort level they might gradually push themselves to greater independence (a more typical approach). Although learners' reactions and processes naturally vary depending on the learning task and situation, a conforming learner is unlikely to become a performing learner (change learning orientation) very quickly or at all. To change learning orientation is to change the deep-seated psychological sources that influence learning. For example, a conforming learner that intentionally experiences more risk, independence, holistic thinking, and complex problem-solving may over time push themselves into a performing orientation. These considerations about how individuals approach learning differently raise important issues about presenting objects in environments that identify and match these individuals' situational approaches.

Another important consideration is that learning orientations are not arranged in a value hierarchy with transforming learners valued highest at the top. Each learning orientation has strengths and possible areas for intentional improvement. For example, a transforming learner, who wants to learn more intentionally, may focus sometimes on less passion and exploration and attend to short-term details and task-completion. In contrast, a performing learner may want to focus on more holistic, long-term thinking.

Table 1. Four Learning Orientation Profiles

ORIENTATION	CONATIVE/AFFECTIVE ASPECTS	STRATEGIC PLANNING & COMMITTED LEARNING EFFORT	LEARNING AUTONOMY
TRANSFORMING LEARNERS (Innovators)	Focus strong passions and intentions on learning. Are assertive, expert, highly self-motivated learners. Use exploratory learning to transform to high, personal standards.	Set and accomplish personal short- and long-term challenging goals that may not align with goals set by others; maximize effort to reach personal goals. Commit great effort to discover, elaborate, and build new knowledge and meaning.	Assume learning responsibility and self-manage goals, learning, progress, and outcomes. Experience frustration if restricted or given little learning autonomy.
PERFORMING LEARNERS (Implementers)	Focus emotions / intentions on learning selectively or situationally. Self-motivated learners when the content appeals. Meet above-average group standards only when the topic appeals.	Set and achieve short-term, task-oriented goals that meet average-to-high standards; situationally minimize efforts and standards to reach assigned or negotiated standards. Selectively commit measured effort to assimilate and use relevant knowledge and meaning.	Situationally assume learning responsibility in areas of interest but willingly give up control in areas of less interest. Prefer coaching and interaction for achieving goals.
CONFORMING LEARNERS (Sustainers)	Focus intentions and emotions cautiously and routinely as directed. Low-risk, modestly effective, extrinsically motivated learners. Use learning to conform to easily achieved group standards.	Follow and try to accomplish simple task-oriented goals assigned and guided by others, try to please and conform; maximize efforts in supportive environments with safe standards. Commit careful, measured effort to accept and reproduce knowledge to meet external requirements.	Assume little responsibility, manage learning as little as possible, comply, want continual guidance, and expect reinforcement for achieving short-term goals.
RESISTANT LEARNERS (Resistance)	Focus on not cooperating; perceive needs in other directions. Are actively or passively resistant. Avoid using learning to achieve academic goals assigned by others.	Consider lower standards, fewer academic goals, conflicting personal goals, or no goals; maximize or minimize efforts to resist assigned or expected goals either assertively or passively. Chronically avoid learning (apathetic, frustrated, discouraged, or "disobedient").	Assume responsibility for not meeting goals set by others, and set personal goals that avoid meeting formal learning requirements or expectations.
	Situational Performance or Resistance: Learners may situationally improve perform, or resist in response to positive or negative learning conditions or situations		

Designing Learning Objects for Personalized Learning

Unfortunately, current design efforts for learning objects have avoided critical instructional design issues, probably because standards, strategies, and guidelines for personalized learning are still fuzzy concepts for some. As a result, the need for an instructional framework showing how to present learning objects to achieve instructional objectives is being

ignored or overlooked. This situation is comparable to building a house without a blueprint. Two questions have to be asked. How can learning objects be presented in an instructionally sound manner if the presentation is not guided by the appropriate planning, learning, and instructional information? More importantly, how can one conceivably design and develop learning objects without the larger picture of how they should be instructionally used or presented? Wiley (1999) argues that "while current leading object metadata is capable of facilitating reuse and repurposability at the level of instructional clip art, its poverty of instructional design information suggests that it is incapable of achieving the more worthy goal of automating the construction and delivery of individualized, instructionally meaningful material from individual learning objects. That is to say, it currently seems to be incapable of supporting automated instructional development" (p. 9). Wiley (1999) suggested that many alternatives are possible, positing that "an instructional architecture, or instructional event model, can provide detailed specifications for the type and amount of context to build within a learning object" (p.7). He provides Gagne's framework as a simplest case:

> One example [instructional event model] is Gagne's Nine Events of Instruction. If developers were to adopt this model up front, learning objects could be built to fulfill the specific requirements of each step in the instructional process. Then, any learning object which meets the requirement "stimulate recall of prerequisite knowledge for music theory instruction" can be substituted in the place of any other, provided that certain assumptions are met. (p. xx)

Designing Personalized Learning Environments

In the fifties, Cronbach (1957) challenged the field to find "for each individual the treatment to which he can most easily adapt" (p. 681). He suggested that consideration of the

treatments and individual together would determine the best payoff because we "can expect some attributes of person to have strong interactions with treatment variables. These attributes have far greater practical importance than the attributes which have little or no interaction" (p. 681).

Assembling learning objects to create supportive, personalized learning environments is an additional challenge. To be effective, learning objects should be designed to exist in environments that address the unique sources of learning differences and influence success. More specifically, they should emulate the instructor's experienced, intuitive ability to recognize and respond to how individuals learn differently and creatively foster interest, value, enjoyable, and more successful, independent learning. If we are to meet Cronbach's challenge for better learning environments, then we need to learn how to present objects that provide "for each individual the treatment [personalized environment] which he can most easily adapt" for the best payoff. Below are simple guidelines for presenting learning objects to create personalized learning environments for three learning orientations:

For Transforming Learners design discovery-oriented, unsequenced, and mentoring environments. These environments are for learners who want to be passionate, assertive, and challenged by complex problem solving and are able to self-motivate, self-manage, and self-monitor learning and progress to attain high standard, long-term goals.

For Performing Learners design task- or project-oriented, competitive, and interactive (hands-on) environments. These environments should use coaching, practice, and feedback to encourage and support self-motivation, task solving, self-monitoring progress, and task sequencing, while minimizing the need for extra effort, risk, and difficult standards.

For Conforming Learners design simple, scaffolded, structured, facilitated, low-risk environments that use explicit, careful guidance to help individuals learn comfortably in an easy, step-wise fashion.

These descriptions foster comfortable, fun environments that support broad variability in learning from a whole-person perspective, not simply in cognitive terms. They consider how emotions and intentions influence learning and thinking processes. For example, in conforming environments, conforming learners can comfortably manage low risk, linear, and facilitated activities as they achieve carefully sequenced goals and increasing accomplishment. In contrast, the transforming environment would be overwhelming and frustrating for these learners. Emotions and intentions are powerful influences that guide how successfully individuals intend to learn. Presenting learning objects to create personalized learning environments that match learning orientation is a step in meeting the challenges that now confront global education and training.

Metadata Standards for Learning Objects

Learning objects are indeed a good idea, but as long as they lack instructional value, we will be unable to use them effectively. From a practical and technical perspective, common metadata standards define what data needs to be collected and stored to provide descriptive information about a content object. The result is a content object metadata specification (e.g., showing title, author, and description for each object). Metadata standards theoretically should also enable the appropriate use of a content object as a learning object. In this case, the purpose is to enable learners to use one or more learning objects to achieve one or more instructional objectives.

The metadata on a library catalog card provides information commonly used for finding a book or other media form, but has little instructional information concerning the reader's instructional use of the item. If our sole purpose is to provide metadata for describing content objects, the descriptive information commonly included by most standards today is sufficient. However, learning objects have important embedded instructional objectives and, if we are not providing instructional information in metadata, all we have is a content object. If we ignore key instructional issues, how can we successfully use learning objects for learning?

Many groups are working together to define common international standards that the world can adopt for describing learning objects that can be interoperable, reusable, repurposable, and effectively managed and presented. Their common interest is to find a minimum set of metadata standards that will support the worldwide deployment of learning objects for multiple purposes. Just a few of the groups participating in these worldwide standards-making efforts through the IEEE Learning Technology Standards Committee (LTSC, 2000) are:

- Alliance of Remote Instructional Authoring and Distribution Networks for Europe (ARIADNE, 2000)
- Instructional Management Systems (IMS, 2000a) Project
- Dublin Core Education Working Group (DC-Ed, 2000)
- Advanced Distributed Learning Initiative (ADL, 2000)

Nonetheless, the current lack of attention to instructional factors and over reliance on technical or technological issues may result in the development of learning objects that are not widely used even though the products may be technically sophisticated. More than likely, if international metadata standards do not include data instructional and learning information, we may see the rapid rise of incompatible extensions to the metadata. In order to increase the

usability of learning objects, it will be necessary to expand the consideration of higher-level instructional requirements and account for the many factors that impede or facilitate learning.

Extending his simplest case, Wiley (1999) suggested two extensions to learning object metadata that could address this issue. These extensions address the two critical instructional issues that have been addressed in this chapter. He proposes the introduction of one field that identifies the instructional framework or architecture to which the learning object was designed. He proposes a second field that conveys individual-difference information. The following sample metadata is simple and could easily "facilitate an immediately (technologically) implementable method" of delivering personalized instruction (Wiley, 1999, p.10).

Educational Instructional Architecture = Gagne9

Educational. Individual Difference.Orientation = Transforming

Both examples are an attempt to address the critical (higher-level) instructional issues that are being overlooked. In the first example, Wiley (1999) describes instructional architecture, as a common "model that provides for all the events of the instructional process" (p. 10). He use's Gagne's Nine Events of Instruction to illustrate a very simple model. If developers were to adopt a basic model, "learning objects could be built to fulfill the specific requirements of each step in the instructional process" (Wiley, 1999, p. 10). Obviously, establishing a common reference model is difficult, but not impossible. Even if we could agree on two or three models, this is vastly better then totally ignoring the overall instructional purpose of a learning object.

Above, the second example describes a simple method to introduce learning orientations as metadata. The purpose of this metadata element is to alternate the presentation of learning objects to match learning differences from the whole-person perspective. In other words, this tag

would serve as an executive control and might deliver interactivity differently to different learning orientations.

Design Strategies and Guidelines

Several guidelines are included in Table 2 to address possible instructional considerations. These descriptions (organized by three learning orientations) are intended as general design guidance for presenting learning objects. They consider key issues that influence online learning and provide information for accommodating the differences. Their overall purpose is to match the orientation to foster self-motivation, interest, interaction and more successful, independent learning. These same descriptions are also useful for creating a set of evaluation criteria against which learning objects may be evaluated.

Table 2. Strategies and Guidelines for Three Learning Orientations

Learning Issues	Transforming Learners	Performing Learners	Conforming Learners
General Relationship	Prefer loosely structured, mentoring relationships that promote challenging goals, discovery, and self-managed learning.	Prefer semi-complex, semi-structured, coaching relationships that stimulate personal value and provide creative interaction (hands-on).	Prefer safe, structured, guiding relationships that help them avoid mistakes and achieve easy learning goals in a simple fashion.
Goal-Setting and Standards	Set and achieve personal challenging short- and long-term goals that may exceed goals set by others; maximize effort to reach personal goals.	Set and achieve short-term, task-oriented goals that meet average-to-high standards; situationally minimize efforts and standards to reach assigned or negotiated standards.	Follow and try to achieve simple, task-oriented goals assigned by others; try to please and conform; maximize efforts in supportive relationships with safe standards.
Learner Autonomy and Responsibility	They are self-motivated to assume learning responsibility and self-direct goals, learning, progress, and outcomes. They experience frustration if restricted or given little learning autonomy.	They are situationally self-motivated to assume learning responsibility in areas of interest. They willingly give up control and extend less effort in areas of less interest or in restrictive relationships.	They are cautiously motivated, prefer less responsibility and self-directed learning, like to be more compliant, and are ready to follow others.
Knowledge Building	Commit great effort to discover, elaborate, and build new knowledge and meaning.	Selectively commit measured effort to assimilate and use relevant knowledge and meaning.	Commit careful, measured effort to accept and reproduce knowledge to meet external requirements.
Problem Solving	They prefer case studies and complex, whole-to-part, problem-solving opportunities.	They prefer competitive part-to-whole problem solving.	They prefer scaffolded support for simple problem solving.
User Interface	Recommendation: Open learning interface for high stimulation and processing capacity.	Recommendation: Hands-on learning interface for medium stimulation and processing capacity.	Recommendation: Consistent and simple interface for minimal stimulation and processing capacity.
Adapted Presentation	They prefer occasional mentoring and interaction for achieving goals (MENTORING).	They prefer continual coaching and interaction for achieving goals (COACHING).	They prefer continual guidance and reinforcement for achieving short-term goals (GUIDING).
Strategies to Achieve Objectives	Enable high-standard, strategic goal-setting and planning, support realistic personal goals, and ensure putting theory into practice.	Foster personal value (intrinsic benefits) and holistic thinking, offer hands-on, practical support to encourage planning and effort into continual improvements.	Provide time and comprehensive, structured support for adapting training and transitioning skills for improved performance.
Feedback	They prefer inferential feedback.	They prefer concise feedback.	They prefer explicit feedback.
Motivational Feedback	Discovery	Coached discovery	Guided achievement
Learning Module Size	Short, concise, big picture, with links to more detail if necessary	Medium, brief overview with focus on practical application	Longer, detailed guidance, in steps

Learning Issues	Transforming Learners	Performing Learners	Conforming Learners
Information Need	Holistic, specific information needed to solve a problem	General interests, practice, short-term, task-completion focus	Guidance to fill a requirement
Content Structuring	They prefer freedom to construct own content structure.	They prefer general instruction, have a limited ability to reorganize.	They prefer to let others decide the content structure.
Sequencing Methods	Hypertext, adaptive, multiple access. Avoid step-by-step instruction.	Semi-linear, logical branching, access by subtopic. Limit exploration.	Linear, page-turner representations, general access. Avoid learner control and exploration.
Inquiry	Ask probing, in-depth questions about content. Expect inferential, theoretical challenges.	Ask questions to complete assignments. Expect specific, practical directions.	Ask mechanistic questions about assignments. Expect explicit guidance.

Summary

The dream to deliver personalized learning using learning objects that fits the real-time, anywhere, anytime, just-enough needs of the learner is about to become a reality. Today, along with many important developments in instructional psychology, open standards, structured markup languages for interoperable data representation, and the shift of instructional flow control from the client to the server-side, an entirely new foundation is making truly personalized online learning possible. The most obvious benefit of these innovations is the creation of a learning ecology that shares resources from large reservoirs of content where learning objects are shared individually, widely, and more economically.

Technologically, researchers are making rapid progress toward realizing the personalized learning dream with object architecture and adaptive technology. However, two key elements still need to be addressed in the development and use of objects for personalized learning. The first is a whole-person understanding of how individuals want and intend to learn. Primarily cognitive learning solutions (i.e., those whose primary focus is on how learners process and build knowledge) are no longer enough. The second key element is the lack of consideration for

instructional issues in the dynamic presentation of learning objects. When we design learning objects with only a universal type of learner in mind or without guiding their higher-level instructional use we unintentionally set learners up for frustration and possible failure.

Learning objects are expanding the supportive learning role that technology can rightfully play in enhancing learning and correcting learning problems that have continually perplexed training markets in the past.

Personalized learning is important because it supports flexible solutions that dynamically adapt content to fit instructional objectives. For sophisticated learners it also enables them to select components to customize their learner-centric environment. For all learners, it enables them to gain more sophisticated online learning ability over time. How else can learners keep up with the rapid pace of change?

If we are serious about providing good online instruction for learners, we must plan multiple, cost-effective ways to provide instruction and environments so that all learners have opportunities for success. Learning orientations may be a first step in recognizing and accommodating individual learning differences from a whole-person perspective. They may also be an important step in recognizing the expanded, dominant role and impact of emotions and intentions on learning, especially since online learners need to become more independent, self-motivated, and self-directed learners. Additionally, we need to develop common instructional models which can guide the instructional presentation of learning objects for personalized instruction, assessment, and learning environments.

As learners move online, personalized learning is a more sophisticated solution for learning and performance improvement and meaningful online relationships. Hopefully, these

suggestions will contribute to more successful learning via the Internet and a greater understanding about fundamental learning differences and online instructional issues.

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