Optimizing the Pedagogical Impact of Learning Modality-based Learning Objects Using Artificial Intelligence

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Abstract

Learning modality-based learning objects have been created in the form of instructional templates using appropriate pedagogical and learning style orientations and some of these include: time-revealed scenarios, case studies and the intelligent paragraph. Some of the more important pedagogical orientations that have been considered include: determining the prior or available knowledge of learner, presenting material in a logical, motivating and contiguous manner, allowing learner the ability to repeatedly practice what has been learnt, providing feedback on a learning interaction, supporting learners with memory techniques and continuously suiting the content to learning styles. Whilst, most of the above-mentioned pedagogical oricntations could be achieved when preparing the first or introductory set of learning objects, the statement does not hold true for subsequent learning if some form of artificial intelligence is not incorporated into the learning objects. Use of artificial intelligence allows for better management of the learning processes and outcomes for a learner vis-à-vis the learner's dominant learning style. In this presentation, we will discuss some concepts related to pedagogy and learning styles, learning objects, the role of artificial intelligence in achieving these, and provide samples of learning objects that have been created to achieve the contentions forwarded.

Introduction

How does a student learn best? Research shows that when a student's learning orientation is matched by strategies that supports his/her learning style, learning optimization occurs. In an e-learning environment, where the amount of contact hours between a student and an expert are less, it is important that students are provided with learning resources that are tuned to the student's learning style. How can this be factored in, in a technology-based learning environment?

Historically, we have since that in the 1990's teaching and learning were transformed by the increasing power of multi-media computers, broadband networks and significant improvements in design and delivery of pedagogical content via electronic means. The industry went from CBL (Computer Based Learning) and rudimentary synchronous learning applications to sophisticated e-Learning platforms. Though a variety of subjects

can be effectively taught online, the knowledge and experience of a great teacher cannot be qualitatively replicated by a computer model.

However, as e-Learning matures, the many significant benefits of these technologies are beginning to be realized and find their place as an adjunct to traditional pedagogical approaches. These first forays into network delivered learning objects shattered the twin barriers of WHEN (Time) and WHERE (Space) students can access pedagogical experiences, thus effectively unchaining students from the requirement of being present in a specific location at a specific time in order to learn. However, one primary obstacle facing e-Learning is its inherent "one-size-fits-all" approach. Though we find similar problems within a classroom environment, the interaction with the teacher can help mitigate the effects of homogenized learning (often tailored to the lowest common denominator), by blending qualitative moments of one-on-one interaction during lessons or lectures. In order to fully reach its potential, e-Learning must begin addressing 'how' individuals learn and adapt online instructional styles to the specific needs of the learner. Just as a good private teacher adapts his/her teaching methods to the individual student in question and over time gains understanding of which methods work for a specific individual, e-Learning technologies will need to become more "intelligent" by profiling students in real-time and delivering pedagogical content according to a series of fluid parameters that monitor student interaction with the learning content and present materials in a style that has the highest probability of success.

Pedagogy and Learning Styles

What is the current view of pedagogy and learning styles? According to Coffield, Moseley, Hall, & Ecclestone,(2004) the treatment of pedagogy in the learning styles literature is more heavily oriented towards psychology. Pedagogical orientations must impact heavily on developing the minds of learners and not just providing them with content. In this respect, it would be interesting to view the arguments forwarded by Bruner (1996) vis-à-vis learning styles. Bruner proposed four alternative models related to the minds of learners as viewed by educators:

1. Are learners empty vessels to be filled with knowledge?
2. Are learners apprentices in learning?
3. Are learners sophisticated knowers who are able to distinguish between personal and objective knowledge?
4. Are learners collaborators who can learn through participation of their own and other people's minds?

Bruner's arguments should be viewed seriously by educators so that a more distinct and serious effort can be taken to impact upon teachers to rethink about their what he called " folk teaching idiosyncrasies" and start looking at how they view learning in a different light.

Learning Objects and Learning Styles

Learning objects are interactive exercises that allow the student to use the content learned in a particular part of a course and; (1) demonstrate mastery of the content, (2) apply that knowledge to solving a problem, and (3) use the content in a critical thinking exercise that both demonstrates mastery and allows the student to place the content within the context of the larger course topic. In creating learning objects, the following expertise is needed: a subject matter expert, an instructional designer, a multimedia programmer and a graphics designer. It is clearly impractical to always have such a big team of people together as time is a limiting factor. What is practical is to define learning objects in terms of the styles in which we teach and learn. There are three basic learning modalities: visual (learning by seeing), auditory (learning by hearing), and kinesthetic (learning by doing). Most people have one predominant modality, but some have a balance between two or even all three. Most educators tend to teach to those learning styles, consciously or not, because they know from experience that teaching styles that are linked to the ways in which students learn are most effective. If we were to define learning objects more in terms of the teaching and learning styles the objects utilize and less in terms of the specific content or programming strategy, programmers and instructors can more clearly understand each other and the role each plays in the design process. The instructor can be more involved in the design of the learning objects if the objects are defined in terms of a context (teaching and learning styles) that he or she can understand. Developing a common language of design cuts the cost of developing individual learning objects; however, the cost remains high if each object is designed from scratch. It also allows designers and programmers to move from content area to content area using the same nomenclature and design principles because teaching and learning styles are independent of topic area

A set of learning objects has been created that are defined by and designed for some of the important styles of learning and teaching. These learning objects are part of a set of reprogrammable templates that can be applied to any topic area with little or no modification. The template system allows an instructor to create learning objects on a discrete body of content in several learning modalities, and allows the student to learn in the modality best suited to his or her style of learning. When combined with artificial intelligence software the entire set of learning objects for a course may be tailored to the learner's style of learning, in order to ensure mastery of content.

Some of the basic learning styles that have been identified include; visual learning, writing skills, critical thinking, time-revealed scenarios, case studies and empirical observation.

Learning Objects and Artificial Intelligence

When combined with artificial intelligence software the entire set of learning objects for a course may be tailored to the learner's style of learning, in order to ensure mastery of content. What is artificial intelligence? According to McCarthy(2004), it is the science and engineering of making intelligent computer programs. It is related to the similar task

of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

Artificial intelligence as build into the instructional templates assumes the following processes. When a student encounters the first block of content, several learning objects in variable modes of learning are attempted. The results of the student's attempts are then evaluated in real-time by an artificial intelligence-based assessment tool, and a profile is built for that student. The learning objects for the next content area are then presented in the order of learning modalities best suited to the students learning style. The assessment tool then updates the profile and reconfigures the order of learning objects in the various learning styles for the next content area. By the completion of the course the student will not only have mastered the content in learning modalities best suited to his or her learning style, but will also strengthen his or her skills in the other learning styles.

Examples of Learning Objects

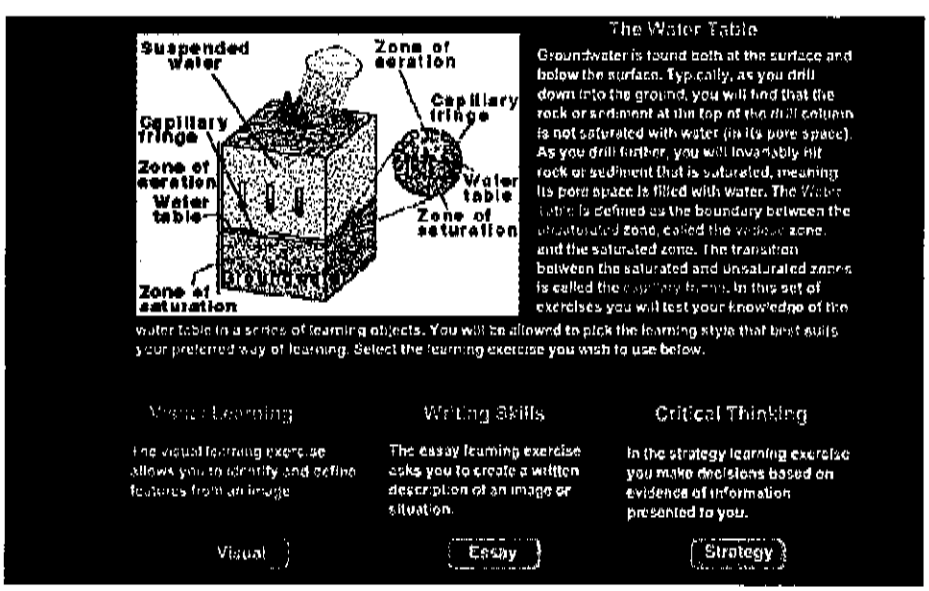
To examine this approach to AI-based learning objects, click the links below. The first link is a geology exercise and the second one is a business (finance) exercise.

Geology AI-based LO

Finance AI-based LO

Another approach is to let the student decide which learning style to utilize and to embed the most common learning styles in a single learning object. The student moves through an introduction to the content that contains multiple learning styles, and then is asked to choose a learning style when the problem to be solved is introduced. To examine this approach, click the link below.

Student Choice



Conclusion

In constructing learning objects, the following concerns are important to be considered:

1. Learning objects must be pedagogically sound (content is motivating, contiguous, allows for repeated practice and enhances retrieval strategies).
2. Learners should be given the option of learning that will allow for the enrichment of learner mind as proposed by Bruner (empty vessel?, apprentices in learning?, sophisticated knowers? & collaborators?)
3. Artificial intelligence has to be well conceptualized and incorporated to capitalize the natural learning styles of a learner so that flexible learning orientations can be suited to the learner.

References

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