Integrating Didactic and Experiential Training: Round Pegs in Square Holes?

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ABSTRACT

Training is a fundamental activity for military readiness. To reach and maintain a high level of performance, individuals must be taught the information and then offered the opportunity to practice the skills critical to their roles and responsibilities. In many instances, didactic instruction (either classroom or computer-based) is provided separately from experiential instruction. Warfighters today have the benefits of computer technology that can be used to facilitate instruction—both didactic and experiential—in the same environment. However, the separation between these two types of training—now exemplified by e-learning (didactic) and PC-based simulation (experiential)—remains largely divided. This is an unfortunate circumstance that does not allow warfighters to "train as they operate." To address this apparent gap, the Joint Advance Distributed Learning (JADL) Co-lab is exploring ways in which didactic and experiential learning approaches can be synthesized. The current version of SCORM (Sharable Content Object Reference Model) supports many types of curriculum sequencing, but has a number of architectural and pedagogical limitations when didactic/experiential integration is the desired end result. This is in part a consequence of the differences between e-learning and simulation, including the overall objectives of training, the clarity of performance measurement, the necessity of "roles" in instruction, and the degree of non-linearity implied by the instructional technique. The incongruity of the approaches requires careful thought as to effective integration. This paper presents a number workflows (or templates) which illustrate the variety of instructional possibilities inherent in integrated didactic/experiential training. These contextually-anchored use cases are intended to guide instructional designers as they increase the degree of integration in computer-supported instruction. The implications of these workflows onto the SCORM 2004 standard and the JADL 2010 Integrated Prototype Architecture (IPA) are discussed.

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INTRODUCTION

In complex environments, both domain knowledge and procedural skills are required to excel, and instruction and training are the means to those ends. It is also evident that experiential training and didactic instruction are essential for individuals to perform their jobs to the best of their abilities. This is especially true in the military, where individuals are often exposed to life-threatening activities that they would not have previously experienced. In demanding environments like these, a constant measure of training and instruction is required. Computer-based training is a feasible medium for both experiential training and didactic instruction.

Personal computers (PC) allow for seemingly infinite possibilities for instruction and training. The amount of information accessible from low-cost, networked computer systems is inexhaustible; the sophistication of virtual environments increasingly high; and the number of ways for trainees to interact growing. While the range of possibilities is theoretically without limit, *pedagogical considerations* should guide which computer-supported training approaches to use and how to combine them effectively. Two classes of computer-based training that are often discussed in the context of training and instruction are (1) experiential training and (2) instruction of didactic information. In this report, we discuss the differences between these two instructional classes and ways in which these two classes can be blended to maximize the impact of computer-based training.

Defining Didactic and Experiential Instructional Modes

There are many types of computer-based instruction and training methods. In order to successfully blend or merge them, it is helpful to understand the breadth of techniques and focus on a few key genres.

Instruction typically refers to the act of imparting or communicating information from an authority to a novice. This activity is often referred to as didactic. Reading a book, attending a series of course lectures, or having a moderated discussion are all types of didactic instruction, as information is passed from teacher to pupil or from the collective to the individual. For example, when learning to drive, both a classroom-based driver's education course and the driving manual itself are sources of instruction. Many of these methods can be transferred to the PC, from the informal (e.g., online discussion) to the formal (e.g., college lectures as podcast and web-based courses). These PC-supported instructional methods are collectively known as *e-learning*, and have been gaining popularity steadily. For example, in 2005, over 3.2 million Americans participated in an on-line course, a 40% increase from 2004 (Allen & Seaman, 2006).

The particular types of computer-supported didactic instruction discussed in this report are those specified by the SCORM 2004 standard. Instructors create web-based courses of variable length in which the student progresses through a series of instructional modules. To ensure that the information is being learned, progress through these modules can be gated by a post-module test. Advancement through the course is largely self-paced, and instruction is individual rather than collective. While SCORM supports many types of sequencing, in practice progress through courses is typically linear; the student proceeds through a set series of modules rather than moving indiscriminately. However, the start point may be moved based on success on a pre-test, and remediation is possible based on straightforward sequencing guidelines. The performance of individual students can be tracked both within and between courses to help maintain a record of the student's understanding in a particular area. Note that didactic instruction controlled by a Learning Management System (LMS) does not need to be static in nature; information presentation can be dynamic or interactive as long as it adheres to the SCORM specification. The linearity of many courses reduces the complexity of both the instructional design and the implementation, but in effect limits instructional possibilities unnecessarily.

While didactic instruction is information focused, a lot of training is more "action oriented." Experiential training refers to the skill or competency acquisition relating to specific practical activities. It is referred to as *experiential* in that the student learns through the activity of doing. Returning to the example of driver education, while the course and manual are didactic in nature, the time spent behind the wheel of the vehicle can be construed as *experiential training*. Similarly, while a chemistry lecture is typically didactic in nature, the laboratory practicum is experiential. In this way, both skills and knowledge can be imparted through direct experience in a controlled setting. Within the military, there is a long tradition of experiential training. Time at a firing range, hand-to-hand combat practice, and a complex pre-deployment exercise are all forms of experiential training. One type of experiential training medium is *simulation.* Within the training establishment, simulation refers to the emulation of one environment or domain in another location or environment. A battlefield exercise is in part a simulation of the expected conditions of warfare. Trainees learn the proper actions to take when faced with particular circumstances, and synthesize skills they may have previously practiced independently. Simulations thus enable principled part- to whole-task instruction.

Computers support multiple types of experiential training, including many varieties of simulation. For example, simulators with high visual and functional fidelity exist for training in a range of military domains (air, ground, surface, undersea, etc.), allowing warfighters to practice procedures and maneuvers without risk of injury or damage. While high fidelity simulations emulate real-world conditions well, the specialized hardware and software demands make widespread use of these tools impractical. Furthermore, in many cases, instructional requirements do not warrant such high-fidelity training tools. Effective simulation can occur using standard PC equipment. Although these simulations typically have lower physical fidelity than do platform-dedicated simulators, they often have a high degree of functional and cognitive fidelity, enabling them to recreate many of the decision-making and task execution circumstances that would be encountered in the field. Any environment can be represented within simulation, and those skills which do not require complete immersion to experience can be supported with such systems.

Because of the seemingly complementary nature of didactic instruction and experiential simulation, they have been used in conjunction with each other in many circumstances. The combination of the “rules of the road” and in-car experience are essential to learning how to drive. Soldiers receive both classroom education and experience on the range. In computer supported learning, individuals often receive both didactic instruction via web-content mediated by an LMS and experience in a simulation – if the training warrants it. For example, a pilot in early training may go through an on-line course and then spend time within a PC-based simulation. Similarly, a soldier learning the mechanics of becoming a forward observer may go through a series of lessons and then complete a few sessions of training in a forward observer simulation.

Using Didactic and Experiential Applications Together

Both didactic and experiential instructional applications are widely used in training and instruction, due in part to the ubiquity of PCs. As courses of instruction demand, trainers employ simulations to keep their students informed and skilled. Using the management capabilities of an LMS, instructors can track progress through courses and attend to gaps in knowledge through remediation. Within the simulation, instructors can control the types of experiences faced by their students and perhaps measure their success in managing those events. While many trainers use both simulation and didactic content, they do not typically use a unified application for both types of instruction.

There have been several attempts to integrate didactic and experiential training (e.g., Haynes et al., 2004; Carlisle & Smith, 2005; Biddle et al., 1996; Conkey et al., 2006; Gallagher & Altalib 2006). These attempts have been diverse in their approaches. The SCORM standard for courseware and High Level Architecture (HLA) standard for simulation interoperability can be directly linked, so that simulation content can be launched from the didactic training lesson (a Sharable Content Object, or SCO), monitor performance, and communicate simulation achievement to the LMS. In most of these research efforts, simulations either contain assessment functionality or interact with other components that perform assessment and deliver results to LMS. Remediation can involve presenting new didactic web-content, reviewing old didactic web content, or revisiting the simulation with either the same or different parameter set. However, it is important to note that these efforts have produced single-point examples, and have not led to a general, re-usable approach to integrated training.

To create a usable didactic/experiential system, significant attention needs to be paid to the logical soundness of the underlying software architecture. The Joint ADL Co-Lab laid out its vision of this system as part of the 2012 Integrated Prototype Architecture (IPA). Various software components allow a trainee/student to move seamlessly from didactic courseware to simulation and back again, based on instructional needs. This vision is currently being realized as part of BBN Technology's implementation of the JADL architecture. An extension of previous efforts to manage experiential training (MacMillan et al, 2005; Weil et al., 2005), the current effort effectively merges the two training approaches by reconceptualizeing the unit of simulation training to increase similarity with units of didactic instruction (e.g., SCOs). Many commercial simulations are temporally open-ended, allowing the user to remain in the experience indefinitely. Others lack clear instructional objectives, or lack the means to measure performance against stated objectives. A key ingredient of the IPA is the Distributed Training Event Coordination Service (DTECS). The DTECS defines simulation objects, or training packages, and allows instructional designers to create training curricula that facilitate movement from traditional SCOs to simulation events. The DTECS provides a framework for specifying the configuration of a simulation, for identifying the training objectives that the particular configuration addresses, and for collecting a trainee's performance in the form of scores against those objectives. Training system developers are responsible for identifying the training objectives that the simulation addresses, providing a means to configure the simulation to address different objectives, and track trainee performance against those objectives. The DTECS provides the means to match those training systems to appropriate didactic content by matching the training objectives in the training simulation to the objectives in the SCORM course.

This report does not speak to the technical implications of a merged system (see Travers et al, 2007), but instead discusses the training implications of such a system. The efforts described in this section have concentrated largely on the mechanics of run-time communication between two types of computer applications. It is clear that it is possible to create a system that incorporates experiential simulation and didactic instruction, as illustrated by the proof-of-concept application described in Travers et al (2007).

DIFFERENCES AND SIMILARITIES BETWEEN SIMULATION AND DIDACTIC INSTRUCTION

There are sound pedagogical reasons to blend didactic and experiential instruction (see Kalb 1971; Kolb et al., 2000). Still, there are differences between the two instructional methods that make curriculum development challenging. Before discussing workflows for curriculum design, it is helpful to articulate these differences and the pedagogical and pragmatic implications. If the two approaches are truly different, the technology that is designed to merge them will be unwieldy and unusable. This would be akin to forcing round pegs into square holes.

Clarity of Objectives of Training

Effective instruction requires defining training objectives. Although people can learn simply by reading relevant documents or opportunistically engaging in activities, assessment against objectives and feedback are essential for efficient and effective instruction (Gagne et al, 1992). The clarity of objectives varies greatly within and between different instructional modes, and this has implications for curriculum development.

- **Didactic.** In a well designed course, the goals of the training are explicit. For example, the purpose of a driver's education tutorial is to learn specific facts that are applicable to the task of driving. This overarching goal can be decomposed into smaller goals. In a formal course, each of these goals might be addressed in a separate learning module, or they could be intermingled over multiple learning modules. In either case, it is possible to explicitly identify these objectives and assess performance against them.

- **Simulation.** The training objectives in simulation are typically less well formed than in didactic instruction. This is in part due to lack of an unambiguous relationship between observable behaviors and the desired task. Consider a driving simulation. If a person makes a turn at an excessive speed, they could be performing poorly against the objective of "adherence to lawful practices" but well against the objective of "performs emergency maneuvers." Performance is contextually dependent, and sometimes subjective. Often there are multiple objectives being trained simultaneously, and observable behaviors within the simulation could apply to several of them simultaneously. High-fidelity simulators often have well formed training objectives; PC-based simulations based on games often do not because the main goal is entertainment rather than education.

Granularity of Training

Training objectives can be defined at multiple levels of granularity, with assessments of performance for each level. The objective "learn to drive an automobile" can be subdivided into "learn to start the engine," "learn to accelerate efficiently," and "learn to turn." They can also be decomposed in multiple ways, with implications for the best instructional approach. For example, "learn how to drive an automatic transmission vehicle" or "learn how to drive a manual transmission vehicle" is one top level decomposition of instruction; "learn the driving laws in your state" and "learn the mechanics of driving" is another.

- **Didactic.** There is a debate among instructional designers about the proper level of granularity within a SCO. Because of the versatility of the standard, a single SCO can encompass a whole course – encapsulating other technologies for sequencing – or comprise an element of a larger course. Training objectives, similarly, exist at different levels of granularity. They can be complementary (e.g., "Learn to identify birds of North America" and "Learn to identify birds of South America") or hierarchical (e.g., "Learn to identify birds of North America" and "Learn to identify the birds of Florida"), and they can be of very different levels of specificity. There are no widely accepted guidelines; the instructional goals of the training dictate the level of granularity for training objectives. In fact, anecdotal evidence suggests that instructional designers often choose levels of granularity not based upon pedagogical considerations, but instead on technical constraints.

- **Simulation.** The unit of instruction in simulation-based training is typically a scenario, mission, or training package (MacMillan et al., 2005). The scope of these units varies widely as the purpose of the training varies. For example, time in a simulation may be bounded by timing only (e.g., use this application for 60 minutes) or by the completion of goals within the simulation (e.g., the session is complete when you reach checkpoint A). With regards to training *objectives,* as in didactic instruction, there is little in the way of guidance for the level of specificity in simulation. Objectives can be general ("Learn the fundamentals of driving") or specific ("Learn how to operate a 1978 Dodge Dart"). They can also be complementary, hierarchical, or haphazard. It is the responsibility of instructional designers to make pedagogically informed decisions.

Neither didactic nor simulation instructional modes require consistent levels of granularity. This is both a benefit and a drawback to e-learning in general. The major benefit is flexibility; the instructional designer has leeway to make decisions that are ideal for the particular domain. If an instructional designer is creating the training material from scratch, this flexibility would allow for greater instructional movement from web-based didactic content to simulation. One major drawback regards the reuse of material from one training program to another. Among the stated goals of the ADL Initiative is content or SCO *reusability,* which would allow instructors to refer to a library of SCOs to create training at lower cost. However, if the scope of the SCO or the objectives addressed by that SCO differ from unit to unit, it is difficult to use them together.

This should not imply that there is a definable ideal level of granularity for training objects (be they SCOs or scenarios) in all training situations. However, the level of specificity of training *objectives* should remain constant, at least within a course that includes both didactic and experiential components. The Lightweight Scenario Format (LSF) data structure defined in the IPA provides a mapping between SCORM and experiential objectives. This facilitates interoperation between didactic and experiential components, and simplifies instructional design.

Performance Tracking

Within the context of an online or classroom course, students and trainees may go through multiple simulations and didactic instructional components. In many instances, it is advantageous to monitor practice over multiple sessions. In fact, this is a primary benefit of using an LMS. The reasons for performance tracking do not differ significantly between didactic and simulation applications, although the elements tracked might.

- **Didactic.** Within an LMS, there are a number of elements that can be tracked. A student's progression through a course and achievement against specified learning objectives can be used both to influence sequencing and to inform instructors of progress. Poor performance against an objective – stored in a common repository – may influence sequencing or remediation in a subsequent course. Stored performance measures can also allow for aggregated scores for a cohort of students, informing the instructor of the strength of instructional content.

- **Simulation.** Like didactic instruction, performance tracking allows for more tailored instruction and multi-person aggregation. Performance against objectives – stored in a repository – can influence the simulation elements in subsequent training events. However, the types of information that can and should be stored differ in simulation than in didactic instruction. Whereas performance against a didactic objective may be as straightforward as a test score, the complex relationship between behavior and objectives in a training simulation may require that additional information be stored for later use – for purposes other than performance measurement. This may include contextual information about performance, indication of trainee *Role*, or relative importance of the objective.

Performance tracking is essential for trainers to feed information back to students and trainees, and both didactic and simulation instructional approaches benefit from tracking and stored performance. Performance tracking aids in subsequent analysis, after action review preparation, and follow-on training development. The posited added requirements for simulation performance tracking requires both that the simulation be instrumented for measurement *and* that the users are able to relate those simulation measures to training objectives.

Definition of Training Objectives

The SCORM 2004 standard includes provisions for the definition of one or more training objective for a particular SCO. Similarly, training objectives can be enumerated for simulation-based training. Are these two uses of the phrase "training objective" equivalent?

- **Didactic.** Typically, an online course of didactic content will include multiple sections, each one discussing important information about one or more objectives. Achievement against those objectives is operationally defined in the SCORM standard as a score on a scale normalized from -1 to 1. The types of objectives found in didactic training are linked to the information being presented, and thus are about specific knowledge to be acquired.

- **Simulation.** In contrast, objectives within simulations can be more diverse. While knowledge of facts or information can be conveyed through experiential learning, completion of a task, efficiency of task completion, and task latency can also be measured. Another element of training objective definition in simulation is the idea of a "condition." Condition modulates assessment; a single training objective can be realized in a number of conditions (e.g., conducting the same simulation event in different weather conditions or the same airplane maneuvers with different lighting conditions).

Both didactic and simulation instructional methods benefit from defining explicit training objectives, but in practice these objectives tend to have different characteristics. Didactic training objectives tend to be information oriented; information encoding is measured via tests of understanding and comprehension. Simulation training objectives are largely task oriented, and can take advantage of information about task efficiency and completeness. The two methods have in common the existence of training objectives and the need for measurement, but not necessarily the "species" of objective or type of measurement.

Implication of Linearity

When one thinks of a school course, one tends to think of a linear progression through lessons. In our driving example, a student may first learn the administration of obtaining a license, then some safety concerns, followed by the rules of the road. There are sometimes reasons for this linearity involving the building of knowledge from foundational principles to the final desired mental model. This assumption of linearity, however, is not universal, and is less critical in simulation-based instruction.

- **Didactic.** In many cases of e-learning, progression through a course is strictly linear, although SCORM 2004 does support non-linear sequencing. An individual begins a course with introductory material, and then advances to the next lesson, SCO, or section based upon completion of the previous section. This continues until the course is completed, perhaps with quizzes or tests gating progression. In some cases, test-based advancement or remediation is added to this sequencing. Students can complete a pre-test and be placed in the middle of a course based on their previous knowledge; linear progression might progress from there. Remediation may be accomplished by providing additional content to students based upon performance in a post-test. This may involve returning to sections that had been previously completed. Linearity is important when there is a logical ordinal progression of facts. When learning mathematics, for example, addition should precede multiplication because the principles of multiplication require a knowledge of addition. This is not true in many circumstances; it is not necessary to learn about "effective braking techniques" before learning about "effective steering techniques." These two issues are equivalent, and order may not be important. However, it is standard in e-learning to retain a high degree of linearity regardless of the relationship of content areas.

- **Simulation**. As with didactic training, the linearity of simulation is dependent on the instructional goals of training. Linearity of training exists when one skill or task is required to learn another skill or complete a more complex task. One must first learn how to use a screwdriver before learning how to assemble an engine, and a mechanical simulation may include such linearity. The same is true with part-task training when the order of conditions may be critical for learning. However, in other instances, the very idea of linearity is nonsensical because multiple objectives are being addressed concurrently. In a military convoy simulation, a driver may be simultaneously adhering to the driving regulations, adhering to communications standards, and scanning for obstacles. In didactic training, each of these would need to be described independently, and some order would be necessary. Similarly, the idea of instructional equivalency affects simulation training. There may be no logical rationale for ordering the following experiences: "Driving in the rain," "Driving in the Fog," and "Driving in the Snow." Order is not important as long as all conditions are experienced. Also note that this is not an either/or situation; in some instances linearity is imposed at a high levels (e.g., levels of a game) while there are non-linearities at lower levels.

The expectation for linearity is an essential difference between didactic and simulation-based instruction. The simultaneity of objective assessment in simulation complicates placement of experiential training in a sequence of didactic lessons. Does a driving simulation always go at the end of didactic instruction because it depends on a synthesis of information? Or, can simulation be used throughout, with emphasis on different objectives during each simulation instance? Should pedagogically unneeded linearity be eliminated from didactic instruction?

Do we have Square Pegs and Round Holes?

The preceding discussion noted some significant differences between didactic and experiential training. The concepts of *Roles* and *Conditions* are largely alien to didactic training, but are common in simulation. Objectives tend to be straightforward and separable in didactic instruction whereas they often overlap in experiential training. Linearity is common in both didactic and simulation-based training, although it is a weaker assumption in simulation-based training. Finally, neither form of e-learning has a strong standard for the granularity or clarity of measures relating to training objectives. The flexibility in defining measures may be a blessing in disguise; it allows instructional designers to make decisions based on the instructional designs of the training.

INTEGRATING DIDACTIC AND EXPERIENTIAL TRAINING: SOME SAMPLE WORKFLOWS

The combined use of didactic and experiential training supports complementary training objectives, serves trainees/students with different preferred instructional approaches, and enables more comprehensive performance tracking. In short, using both didactic content and simulation events in a single training curriculum is often advantageous, and having a single framework manage both types of instruction would make the process of curriculum design easier. As part of the JADL Prototype Program, we have been developing just such a service. Travers et al (2007) describe the architecture of a system that facilitates curriculum development with both didactic and segmented simulation training units. This system is flexible in its curriculum implementation; in this paper, the concentration is on best-practice for blended curriculum development. Based on the literature review and previous experience, several design guidelines have been identified. Many of these guidelines are supported by the framework described in Travers et al (2007):

- **The clarity and granularity of Training Objectives should be consistent** between didactic and simulation components of instruction. Both instructional approaches need to have training objectives, and the level of specificity for those objectives should be more or less constant across units of instruction (e.g., a SCO or a simulation session). This will enable smooth movement from one instructional method to the next and support between-method objective development.

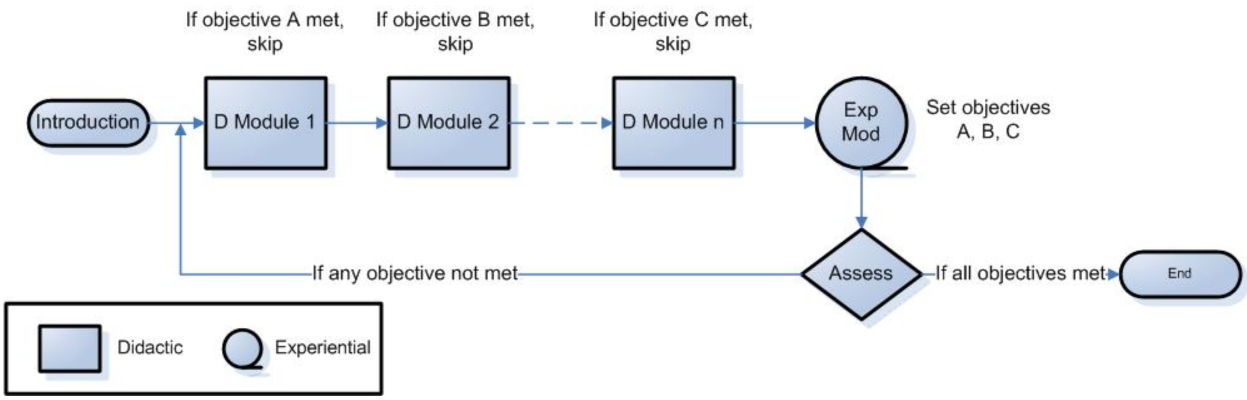

Figure 1: Simple sequence of didactic and experiential components

- **Training Objectives should be linked within and between instructional components.** If there are objectives in common between didactic and simulation components, the commonality can be exploited by mapping SCORM courses to simulation-based training. For example, if someone learns the rules of the road through didactic presentation and is then asked to perform driving maneuvers adhering to those rules, those two instructional components can be brought together by mapping a "Learn the Rules of the Road" training objective. A common framework of objectives, conditions, and measures between the two approaches would enable adaptive sequencing (e.g., to support remediation or acceleration).

- **Trainers must be mindful of linearity of course materials.** Sequencing is one of the most challenging aspects of didactic course design, and linear design tends to be the standard. Because developing non-linear courses is more difficult, it is seldom done. When simulation-based experiential training is added to the curriculum, the expectation for linearity diminishes. Adaptive or role-specific sequencing may prove to be of benefit in cases where the skills or information to learn are not inherently ordinal, but can vary in accordance with the performance/expertise of the trainee.

The following workflows, depicted in Figures 1 and 2, are examples of instructional design strategies that integrate experiential and didactic training components into a single continuum. They are presented as possibilities for structuring courses as the integration becomes easier to achieve. In each example, assessment can be done both as part of the didactic and experiential components. Performance measurement occurs in experiential training when the simulation directly reports scores of some kind against training objectives or when a separate performance assessment engine is used. Didactic modules accomplish performance assessment using the SCORM standard. The results of these assessments may direct the user to different material within the didactic modules or may direct the user to different experiential training.

This first example (Figure 1) is a straightforward example of blending experiential and didactic components, and has been implemented as part of a recent demonstration of concept (Travers et al 2007). The learner begins the course with introductory material, followed by a series of didactic lessons and simulation practice. The Didactic Modules (1, 2, n) each present information on objectives (A, B, C) that are exercised within the simulation. In this example, the performance measurement occurs entirely from within the simulation. If each of the training objectives is met (based on predefined criteria), the Assessment is satisfied and the learner successfully completes the course. If any of the training objectives remain unmet after participating in the simulation, the learner repeats only the relevant didactic lessons and repeats the simulation until all objectives are successfully reached.

The workflow illustrated in Figure 1 includes a single simulation component that measures multiple objectives. In other instances (Figure 2), it is advantageous to use separate simulation events to address different training objectives. In this workflow, the trainee is again presented with introductory material and then a series of lessons and simulation practice. However, rather than exiting the course upon successful achievement of all simulation objectives, the user instead moves on to a second set of lessons and practice. It is upon completion of the second set that a trainee finishes the course. The difference

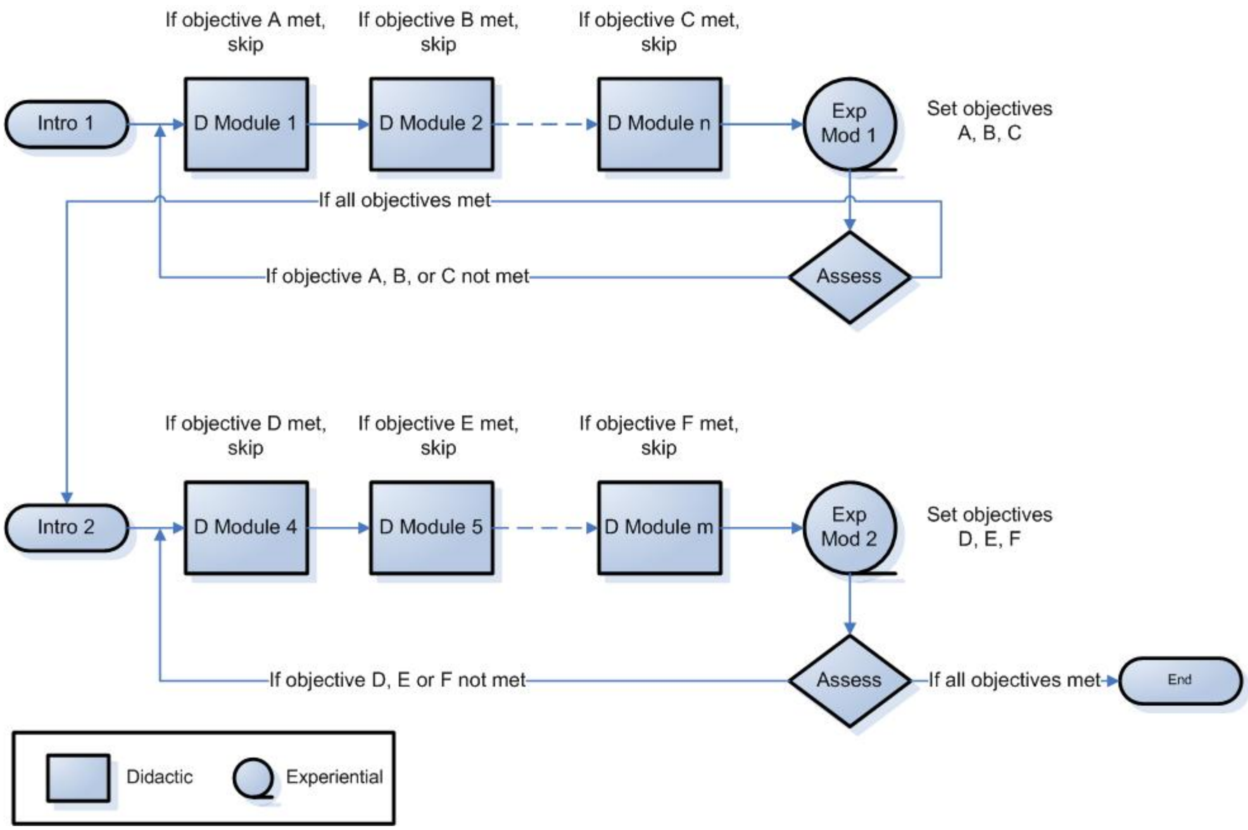

Figure 2. Compound sequence of didactic and experiential components

between Figures 1 and 2 may seem minimal—the replication of instruction. From a design perspective, however, this workflow allows the ordinality of the objectives to be accommodated, and the trainee's attention focused onto particular skills and areas.

Figure 2 presented the trainee with a succession of lessons and simulation. In Figure 3, ordinality is largely abandoned. The course includes a single experiential module and a number of related didactic modules. The trainee begins with introductory material and then is given the choice between the experiential and didactic areas. The experiential module addresses all of the objectives covered by the didactic modules. At the completion of each iteration of the simulation (which can be user, goal, or time driven), the user is presented with one of several didactic modules, the choice of which can be determined based on simulation performance or by random assignment. Once the user has been exposed to all modules—or when all objectives have been met—they move to the final didactic module (D module 4) before concluding the course.

We imagine that this workflow would be useful in domains where there is no rationale for ordering particular experiences or areas of didactic instruction. The order of instruction is instead trainee-focused, allowing the aggregate experience to have higher training impact on the individual.

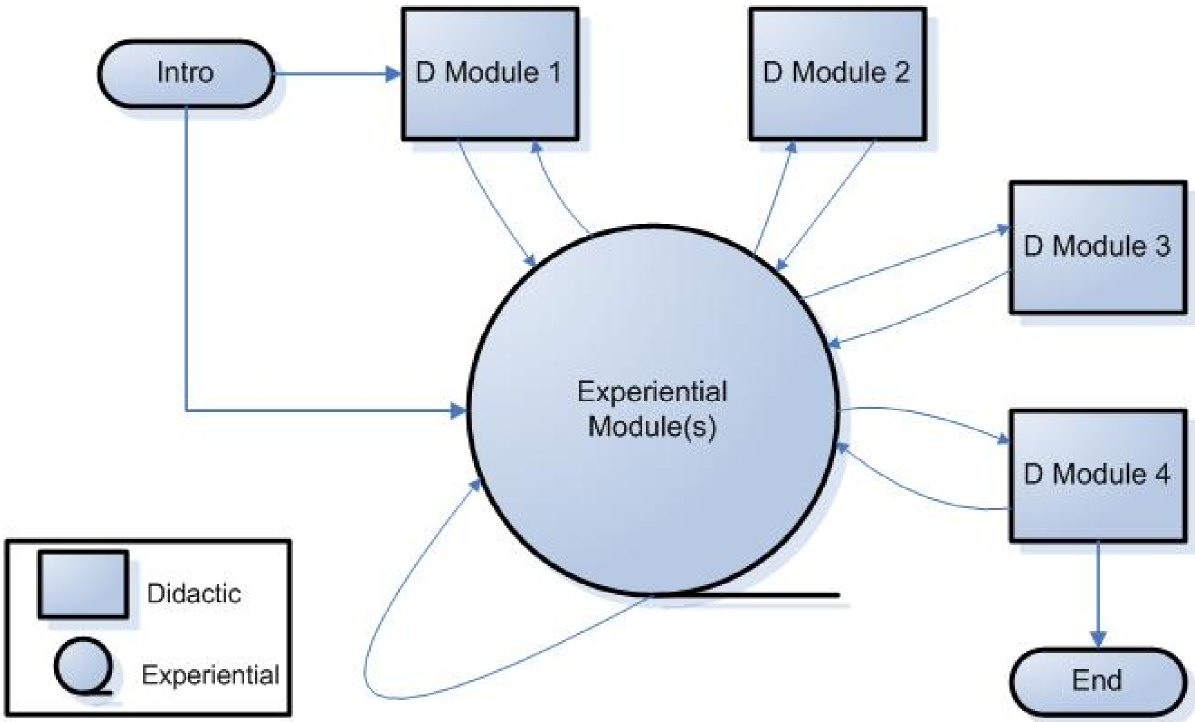

Figure 3. An Example of Non-Linear Sequencing

CONCLUSION

There are many instances in which it would be advantageous to use both didactic and experiential training methods to improve training. Traditionally, these two approaches have been presented separately but in parallel: a driver's manual and behind-the-wheel practice; an instruction book and a board game; doctrine regarding tactics, techniques, and procedures and an artillery simulation. Having these components of training separated was a consequence of technological differences rather than a mindful decision.

This is no longer the case. Recent technological developments (Travers et al 2007) promise to simplify the process of integrating didactic and experiential training components. Users will have the ability to specify role-dependent learning objectives, associate them with both experiential and didactic training objects, and create curricula that sequence these objects and enable multi-faceted performance measurement. While these tools now exist, they are only as useful for training as the curricula that are designed by trainers and instructional designers.

This report is intended to provide some ideas for how to best construct and sequence tasks in a combined the didactic/experiential environments afforded by the DTECS system. The guidance and workflows described above are intended to illustrate some of the ways in which didactic and experiential training components should be put together based on pedagogical considerations. As technology to assist multi-approach curriculum and lesson design becomes more available, it is hoped that these ideas will permeate the instructional design community as a first step to innovation in instruction.

The approach described in this paper has wide applicability. In any environment in which there are both experiential and didactic components of training—especially in domains in which explicit measurement of performance is warranted—the guidelines described herein might have utility. This approach is especially useful in military domains with tactical components, as simulations are often available and occasionally underutilized. However, this hybrid approach has utility for many areas in games, sports, and business.

This report has focused largely on training single individuals. A single trainee is assigned objectives or a course, moves through the components of that course, and completes it when they've successfully completed certain tasks. However, in many cases, the work or area being trained requires the coordinated behaviors of multiple individuals. Returning to the "train as you operate" motto, the training itself might be more effective if multiple people are taking part. This is especially true of the experiential components of training; modern computer simulation allow for hundreds of individuals to interact in virtual spaces. How would you integrate multi-person experiential training with single-person didactic instruction? What do you do when the roles in the experiential training are heterogeneous? How do you manage both the pedagogical and logistical aspects of this marriage of didactic and experiential? This is a fruitful area of future research which is sure to have wide applicability.

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