Automated Learning

Shalin Hai-Jew
Office of Mediated Education
IDT Roundtable
March 2008

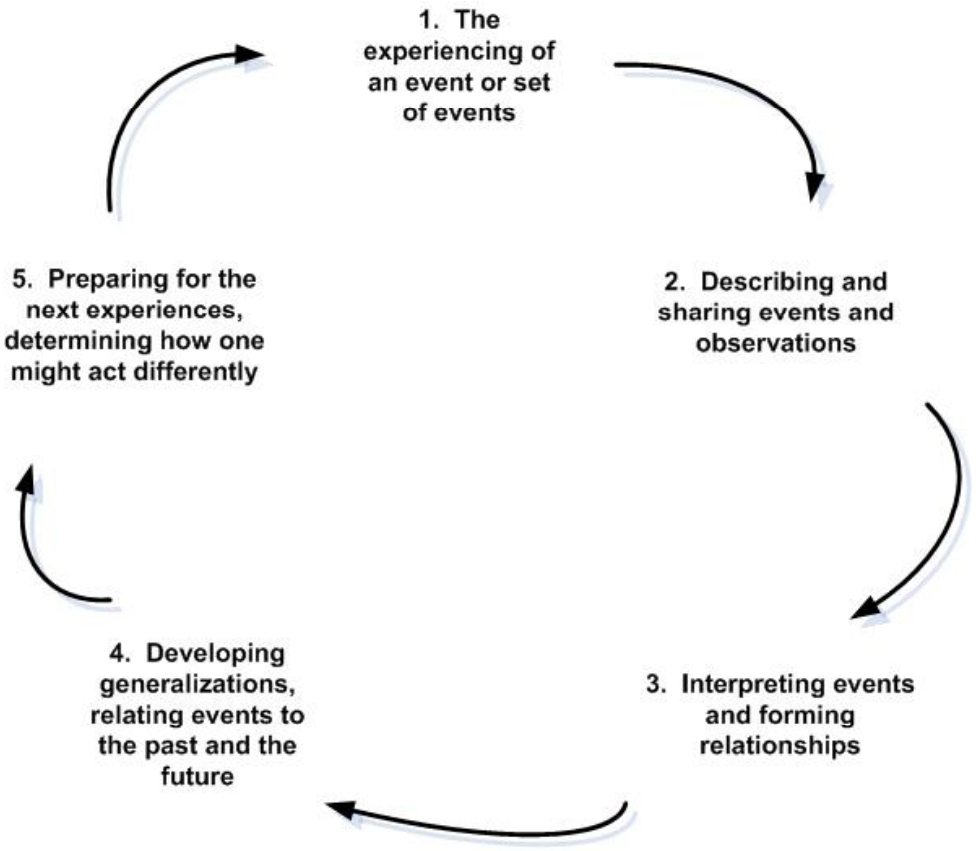
Definition: Automated Learning

- Non-instructor-led (but instructor-designed)
- With or without co-learners (usually "single learner mode")
- Often a kind of computer-based training (CBT) or Web-based training (WBT), or the learner interacting with the programmed computer
- Sometimes via "boxed" or tangible materials (CD / DVD)
- Sometimes immersive virtual learning spaces / environments
- Sometimes discovery learning spaces (albeit often sequenced)
- Sometimes animations and sims, some drill learning
- Plenty of multimedia or rich media experiences
- With or without learner tracking

Applied Pedagogical Theories

- Instructionism vs. constructivism, knowledge transmission vs. knowledge construction
- Kolb's experiential learning theory (concrete experience, reflective observation,
  abstract conceptualization,
  and active experimentation)
- Jacques' Experiential Learning

Jacques' Experiential Learning Cycle



Experiential Learning
(Jacques, 1985, as cited by Gredler, 1992, Ch. 11, p. 2)

General Descriptors of the Learning

- Tends to be close-ended vs. open-ended, pre-determined learning vs. "emergent" non-determined learning
- Tends to involve summative vs. formative assessment
- Tends to be direct (vs. infused) and explicit (vs. tacit) learning
- Tends to be non-perishable and storable to a degree (however, automated learning will still need updating as the learning will become out-of-date at some point)

Why Automation?

- "Offloading the instructor" for cost-savings
- Ability to reach wide population of learners with unlimited repeatability /practice / drills
- Instant feedback for learners
- 24 / 7 availability
- Automated learner tracking
- Consistent knowledge representation and curricular control
- Convenient distribution (and portability)
- Rapid and easy updates

Why Automation? (cont.)

- Supplementary to other types of learning (face-to-face, online, and others)
- Easy control of information (in some password-protected LMS circumstances)
- Potential learner tracking
- Aggregate behavior collection / datamining
- Lower on-the-job training time

When to Automate (Pedagogically)?

- Straightforward and non-complex learning
- General acceptance of that information in the field (non-controversial)
- Procedural and process learning
- Rules or policy-based learning
- Simple simulations, "training simulators," "desktop exercises"
- Clear decision sequencing (via decision trees)
- For familiarization, early exposure, warm-up (connected to other types of learning)
- Prevention of knowledge or skills deterioration / decay

When *Not* to Automate (Pedagogically)?

Curricular Issues

- When there's insufficient development of curriculum and contents
- When controversial, undecided or not fully established contents
- When innovations and creativity (and learner customizing) are important aspects to the learning
- When there's complex learning
- When there is high potential for negative learning or negative "side effects" (incorrect assumptions) to the learning

When *Not* to Automate? (cont.)

Technology Issues

- When the digital learning objects are not interoperable or interchangeable (because of non-conformance to professional international standards)
- When the information is constantly changing or evolving (unless there are sufficient technologies to handle changing informational streams)
- When the technologies are inaccessible (do not meet accessibility criteria) or exclusivist, or involve prohibitively high learning curves

When *Not* to Automate? (cont.)

Peer Support and Constructivist Issues

- When learners have a wide range of disparate learning backgrounds and mental models (and wide adaptive scaffolding is needed)
- When the learners hail from diverse cultures or backgrounds
- When learner and peer-to-peer interactivity are critical to the learning
- When instructor input, nuance, professionalism, guidance, customization and expertise are needed

Automated Learning in Higher Ed

Examples

- High-stakes training at low-cost (institutional review board training on human research) for pre-assessment
- Software training on how to use eportfolio spaces as part of the larger immersive space
- Low-stakes training
- Wet lab simulations (non-comprehensive non-complex sims)
- Decision making sequencing with simple-choice junctures and binary decisions
- Wide proliferation of training about policy and procedure issues
- Part of self-study, or autodidaxy

Automated Learning in Industry

- Automated learning with personal transcript updating
- Professional development
- Large networks (Boeing, Sun Microsystems, Microsoft, and Cisco Systems)
- Simulators + CBT / WBT = total training systems
- Software trainings
- Soft skills trainings
- Partial task trainers
- Interactive tutorials

Four Requirements for CBT

Computer-based training (CBT) refers to training that involves just the learner interacting with the programmed computer.

1. Instructional strategies
2. Learning scenarios
3. Authoring technology
4. Knowledge representations (Freedman and Rosenking, 1986, p. 32)

Sequencing in Automated Learning

- LINEAR:

Learner Work Flow

- BRANCHED:
- SPATIAL (like clustering, spatial mapping, or other):
- LEARNER PROFILE-BASED (deterministic based on learner performance):
- CUSTOMIZED (based on multiple factors, based on learner career path):
- LEARNER-DIRECTED or SELF-SELECTED (empowered learners for savvy self-selection):

Sequencing in Automated Learning (cont.)

- NON-SEQUENTIAL / A LA CARTE SELECTION:
- JUST-IN-TIME (assigned just prior to the need to show competency or for a particular professional work-based situation)
- NO-LEARNER-CONTROL AUTOMATED SEQUENCING / EXPERIENTIAL ONLY, PRE-DETERMINED (linear, branched, other):

The Use of Digital Learning Objects

- Shareable content objects (SCOs)
- Reusable learning objects (RLOs)
- Digital learning objects (DLOs)
- Pre-sequenced learning modules
- Third-party-content boxed courses

- Integrated into a CMS / LMS / LCMS or database

Learner Adaptivity

- Intelligent tutoring (automated tutor 'bots)
- Early learner profiling (and selective customized sequencing)
- Aggregate learner tracking (and the offering of popular learning sequences)
- Self-selection (through learner information and empowerment)

Technos used in Automation

- Databases with front-end user interfaces
- Learning management systems (LMSes) (with gating, as in Axio™ LMS)
- Boxed courses / CDs / DVDs and other tangibles
- Authoring tools for the creation of digital objects (slideshows, animated tutorials, avatars, 3D sensory experiences, interactivity, and others)
- Game engines (for the design of digital play)

High Amount of Development Time

- "CBT production is an enormous effort (100 to 1000 hours of production for a 1 hour course)…" (Muhlhauser, Engineering Web-based multimedia training: Status and perspective," 2000, p. 6)

Levels of Participant Responses

- No response / passive observation / experiential only (screencasts, screen captures, audio – video, multi-sensory experiences)
- Decision junctures / multiple choice / true – false / yes – no / forwards- backwards
- Point-and-click
- Data input, with single or multiple input paths
- Full simulation / immersive (overall strategy with defined objectives, continuous decision-making, social communications aspects)

Planning for Automated Learning

- Assumptions of knowledge domain and interrelationships (ontologies) and relevant "mental models"
- Discrete units of learning
- Definition of the range of learners
- Sequencing design
- Anticipated learner mental conceptions and maps, precognitions, and assumptions (and scaffolding)
- Platform definition: Mobile or non-mobile / Ubiquitous or non-ubiquitous learning / LMS or non-LMS / tangibles – "boxed" or non-boxed / Dedicated work stations or not /

Planning for Automated Learning (cont.)

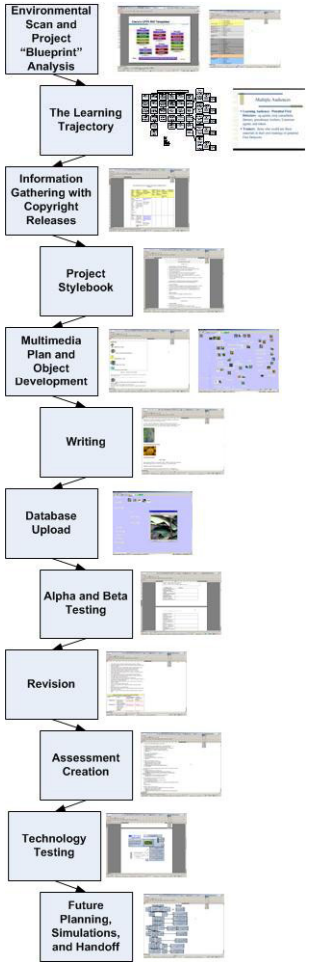
- Open or closed automation (changing evolving information or pre-determined information; live or non-live information)
- Learning pacing for accessibility and accommodations
- Connectivity between learning units
- Access and security levels of information
- Building for limited revisability, raw materials access and design
- Designed learner experience (for example: sensory overload / sensory underload / sensory deprivation)
- Authoring tools

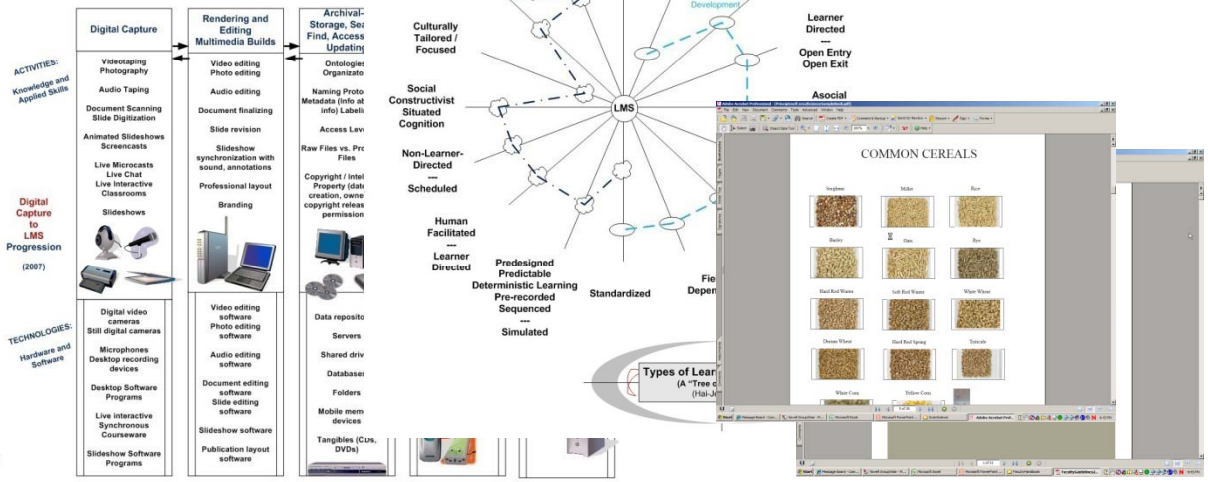
Planning for Automated Learning (cont.)

- Branding look and feel
- Language design (simple English, targeted cultural designs, etc.), translations using automatic foreign language translators
- Scaffolding for range of learners (outliers on a bell curve)
- Accessibility considerations (transcripting, pacing, sequencing, design, colors, aesthetics, font types and size, and others)
- Selective chunking for learner attention and focus
- Feedback loop definition

Planning for Automated Learning (cont.)

- Downloadables
- User testing, alpha and beta testing





Set-ups and Debriefings

- **Human facilitation** for automated learning may add value to the automated learning itself.
- **Setups** may involve pre-learning, defining user expectations, addressing prior mental models, pre-assessments, and overall learner plans.
- **Debriefings** may involve post-learning, re-assessments, customized additional learning, and crediting.

User Motivation

- **Encouraging Revisiting of Automated Curriculum for Review and Deeper Learning:** One study focused on the longitudinal use of various computer-based trainings (CBTs) in a medical environment over time and found that peer competition is one way to encourage use of the automated CBT. Scheduled events may encourage just-in-time training log-ins. Information-rich trainings tend to be revisited while single-concept learning does not (de Man, Bloemendaal and Eggermont, 2007, n.p.).

Post-Learning Value-Added

- Downloads and digital takeaways
- Transfer of learning to practice outside of the automated learning
- Post-automated learning connections with colleagues and peers , support groups
- References for research follow-up
- Relevant websites and resources for additional learning

Learner Tracking and Assessments

- Learner tracking vs. non-learner tracking [If tracked, learners' actions and decision-making and "thoughts" should be understood for efficacy (Drewes and Gonzalez, 1994, pp. 274 – 280)].
- Outcomes assessment (planned and unplanned)
- Performance assessment

Pedagogical Agentry

Some Aspects

- Animated vs. inanimate agentry
- Intelligent vs. non-intelligent agentry
- Affective vs. non-affective (emotionally sensitive) agentry
- Human-like vs. non-humanlike
- Visible vs. non-visible

Rationale

- A digitized "tutor" to humanize the learning

Surrogate Instructors / Facilitators

- Tutorials
- Cognitive instruction
- Corrective feedback
- Encouragements
- Pedagogical guidance
- Tracking, monitoring and grading trainees (Wilson and Parks, "Simulating simulators with computer based training," 1988, p. 1000)

Simulations in Automated Learning

- Selective fidelity (vs. full overall fidelity or low fidelity)
- Definition of "the goal standard" of learner behaviors at any given point and also at the final learning point(s) (Drewes and Gonzalez, 1995, p. 1918) and how feedback will be given to learners

Some Limits of Automated Learning

- Limited collaborative tasking or group work
- Little social learning (in the traditional automated learning build—but may not be so with immersive 3D spaces with other live human participation)
- Lack of human mediation (except for the situation above…)
- Some training for "expertise" (which requires "cognitive apprenticeship" and "case-based teaching") (Chappell and Mitchell, 1997, pp. 1855 – 1860).

Adding Collaboration and Constructivist Elements

- Build self-discovery "situated cognition" spaces for learners to congregate and share virtually
- Create a continuing "community of learners" around particular shared learning topics
- Use the human element to add value and serendipity to the "canned" learning; design some interactivity
- Use short human-facilitated learning segments to add a human touch to the learning (a "hybrid" with automated and human-facilitated learning)
- Build high-value lead-up and debriefing human-mediated activities

Conclusion & Questions

Contact Information

Office of Mediated Education

Instructional Designers

http://id.ome.ksu.edu/