ONLINE FORUMS℠

Two Days. Ten Sessions. Real Learning.

Managing and Repurposing Learning Content:
Proven Strategies and Techniques

August 14 & 15, 2014

601

Automating ADDIE?
We're Not That Far Away!

Robby Robson, Eduworks Corporation

Powered by ADOBE® CONNECT™

THE eLEARNING GUILD™

Raise your hand if you are familiar with ADDIE

Automating ADDIE

We're not that far away!

15 August, 2014

ONLINE FORUMS

What this is about

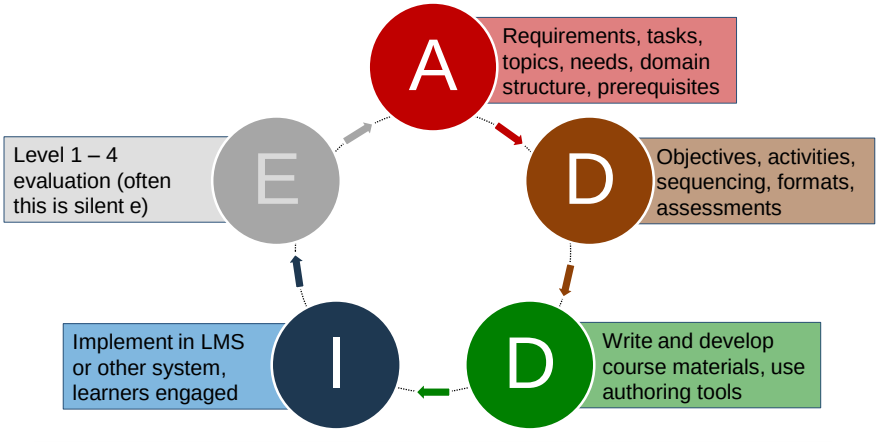
- ADDIE: Analysis, Design, Development, Implementation, Evaluation
- Developing engaging and effective training from boring old manuals, presentations, and documentation
- Using some (possibly scary) technology for a good cause
- Making your job easier by combining process automation with a human-in-the-loop (e.g., you!)
- Possibilities, practicalities and limitations

National Science Foundation · ARL US Army Research Lab · ADL Advanced Distributed Learning

How training is developed today
How long it takes
What is most effective
Reuse is rare

WHAT WE HAVE LEARNED

ADDIE Model (for eLearning)



The content of this session also applies to other models and approaches

Representative data for developing eLearning

Task	ADDIE	% of Total Effort	Hours Required Level 1 - Level 3	
Front End Analysis	A	11%	10	40
Instructional Design	D	13%	10	60
Storyboarding	D	11%	10	50
Multimedia Production	D	23%	20	120
Authoring/Programming	D	18%	15	85
QA Testing	I(E)	6%	5	30
Project Management	--	6%	5	30
SME/Stakeholder Reviews	ADD	6%	5	30
Pilot Test	DI	4%	5	20
Other	(E)	2%	1	2
TOTAL		100%	80	500

Source: http://www.chapmanalliance.com/howlong/

See also 201

These numbers refer to previous sessions

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Most Effective Forms of Instruction

Bloom's Two Sigma Problem

Object of Change	Altered Variable	Effect Size
Teacher	Tutorial Instruction	2.0
Teacher	Reinforcement	1.2
Learner	Feedback-corrective (Mastery Learning)	1.0
Teacher	Cues and explanations	1.0
Teacher, Learner	Student (classroom) participation	1.0
Learner	Student time on task	1.0
Learner	Improved reading/study skills	1.0
Peer Group	Cooperative Learning	0.8
Teacher	Graded homework	0.8
Learner	Initial cognitive prerequisites	0.6

Benjamin Bloom: American Educational Psychologist (1913 - 1999) best known for "Bloom's Taxonomy" (*Taxonomy of educational objectives: the classification of educational goals, 1956)* and "Mastery Learning" (*Learning for Mastery, 1968)*

Secondary Source: http://en.wikipedia.org/wiki/Bloom's_2_Sigma_Problem

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Reuse is rare. ROI is unclear.

See also 101

See also 202

DoD RAND study

Do you agree?

Shanley, M. G., Lewis, M. W., Straus, S. G., Rothenberg, J., & Daugherty, L. (2009). *The prospects for increasing the reuse of digital training content*. Rand Corporation.

Top-down:	Collaborate on course design to reach wider audiences.
RLO (Reusable Learning Object):	Design and reuse digital content as independent objects.
Bottom-up:	Reuses digital assets directly in learning
Concept reuse:	Reuse instructional, analysis and assessment methods.
Structural reuse:	Reuse development structure (from style sheets to LCMS)

Figure 2.1
Extent to Which Different Approaches to Reuse Have Been Employed

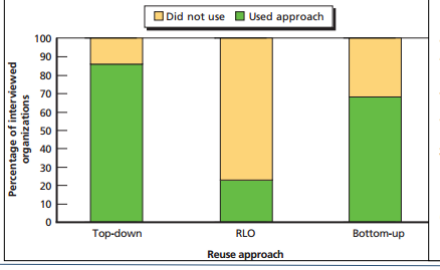
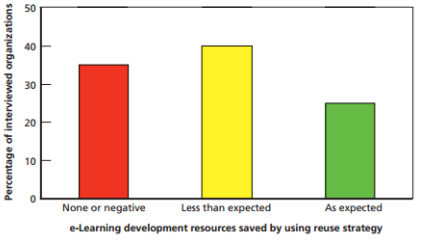


Figure 3.1
The Extent to Which Organizations Saved e-Learning Development Resources by Employing a Reuse Strategy



Opportunities to save time (and money)

Opportunities to improve outcomes

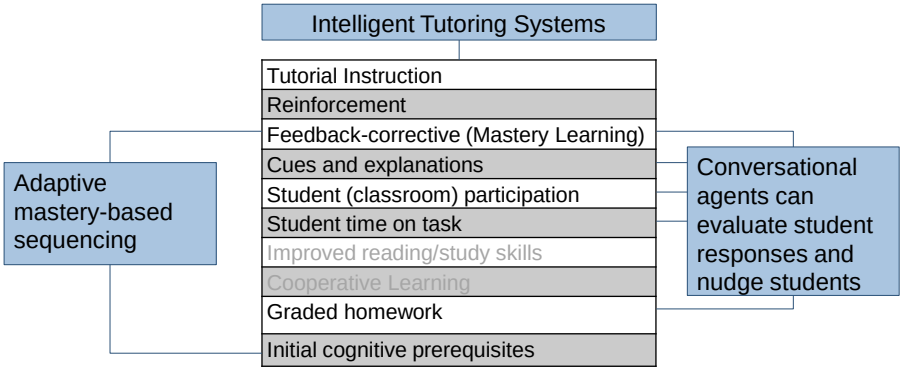
WHAT WE WOULD LIKE

Opportunities to save time

Task	Effort	Opportunities
Front End Analysis	11%	Reuse analysis from source materials
Instructional Design	13%	Reuse instructional design from source materials
Storyboarding	11%	Eliminate by use of templates
Multimedia Production	23%	Extract multimedia from source materials
Authoring/Programming	18%	Leverage templates and existing infrastructure
QA Testing	6%	QA should increase, not decrease*
Project Management	6%	Less time on project = less project management
SME/Stakeholder Reviews	6%	Rely on existing input inherent in source materials
Pilot Test	4%	Reduce testing through better QA
Other	2%	N/A
TOTAL	100%	**Many opportunities to save time – if only we could extract analysis, design and content from source materials and use them in development and implementation process.**

*QA should be integrated into entire process. 6% is VERY low.
Quality upfront translates into large savings later.

Opportunities to improve outcomes

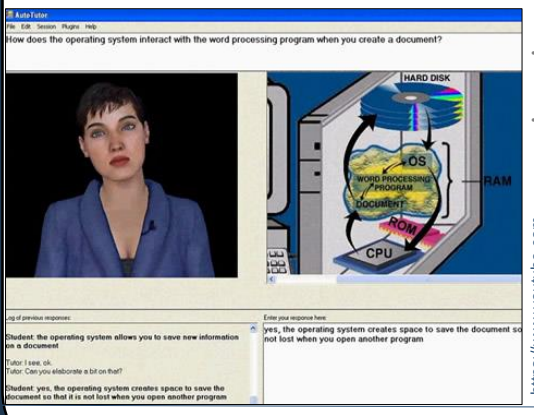


Merrill, D. C., Reiser, B. J., Ranney, M., & Trafton, J. G. (1992). Effective tutoring techniques: A comparison of human tutors and intelligent tutoring systems. *The Journal of the Learning Sciences*, *2*(3), 277-305.

VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, *46*(4), 197-221.

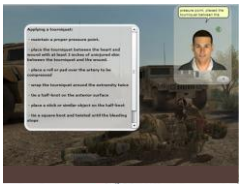
Example: AutoTutor (University of Memphis)

Conversational agent presents material, asks questions, evaluates responses, and gives hints, prompts and pumps.



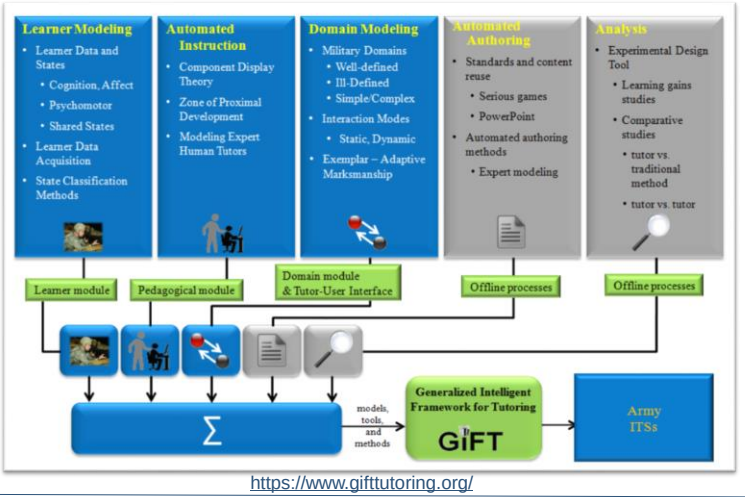
- Graesser, A. C., Wiemer-Hastings, K., Wiemer-Hastings, P., & Kreuz, R. (1999). AutoTutor: A simulation of a human tutor. *Cognitive Systems Research*,*1*(1), 35-51.
- Graesser, A. C., Wiemer-Hastings, P., Wiemer-Hastings, K., Harter, D., Tutoring Research Group, T. R. G., & Person, N. (2000). Using latent semantic analysis to evaluate the contributions of students in AutoTutor. *Interactive Learning Environments*, *8*(2), 129-147.
- Graesser, A. C., Chipman, P., Haynes, B. C., & Olney, A. (2005). AutoTutor: An intelligent tutoring system with mixed-initiative dialogue. *Education, IEEE Transactions on*, *48*(4), 612-618.
- D'Mello, S., Jackson, T., Craig, S., Morgan, B., Chipman, P., White, H., ... & Graesser, A. (2008, June). AutoTutor detects and responds to learners affective and cognitive states. In *Workshop on Emotional and Cognitive Issues at the International Conference on Intelligent Tutoring Systems*.

https://www.youtube.com/watch?v=aPcoZPjL2G8

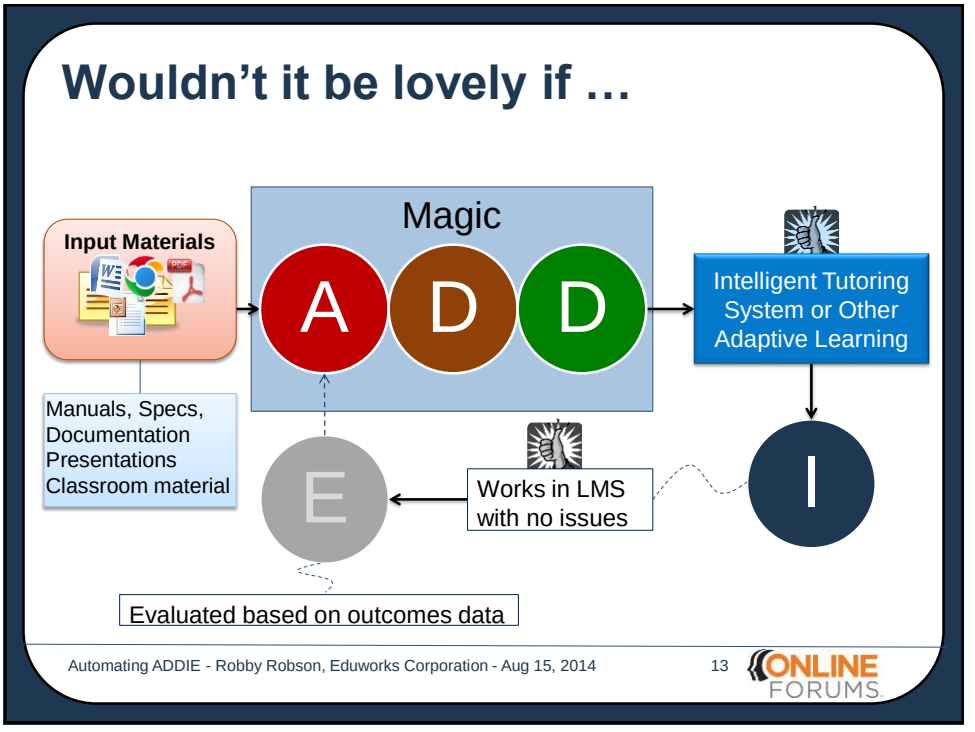


Related Example: GIFT Tutoring

Generalized Intelligent Framework for Tutoring



https://www.gifttutoring.org/


Wouldn't it be lovely if …
Input Materials
Magic
A
D
D
Intelligent Tutoring System or Other Adaptive Learning
Manuals, Specs, Documentation Presentations Classroom material
E
Works in LMS with no issues
I
Evaluated based on outcomes data
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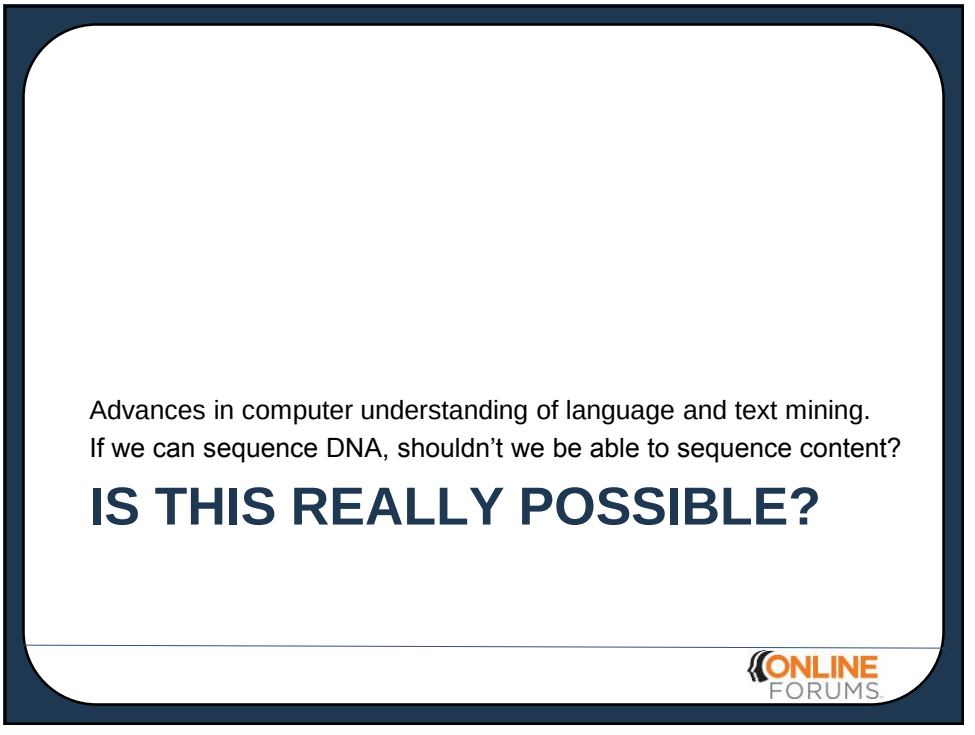

Advances in computer understanding of language and text mining.
If we can sequence DNA, shouldn't we be able to sequence content?
IS THIS REALLY POSSIBLE?

Computers are starting to understand English

- Computers are good at computing
- Computers are bad at language
- **But they are getting much better**

Products ranging from phones to automobiles to automated essay graders recognize *and interpret* natural language

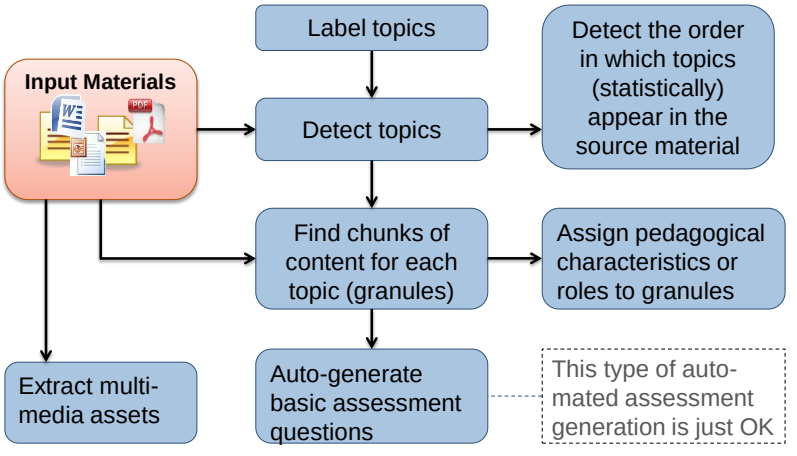
PEARSON

Intelligent Essay Assessor (IEA) is a Web-based service that automatically evaluates a student's writing skills and knowledge, providing scoring and diagnostic feedback to both the instructor and student. This automated scoring technology uses sophisticated linear algebraic models to analyze the meaning of written text at a deeper level than just key words or patterns. Research has shown that IEA produces scores that accurately match those of expert human readers. IEA can also be customized for your testing needs.

Does this jibe with your experience?

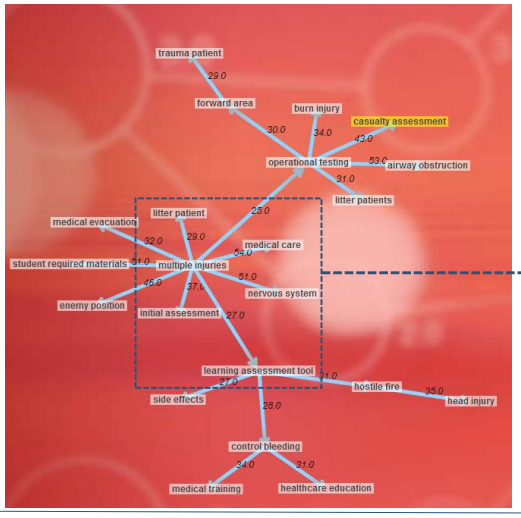
See also 402

Things a computer can do (seriously)

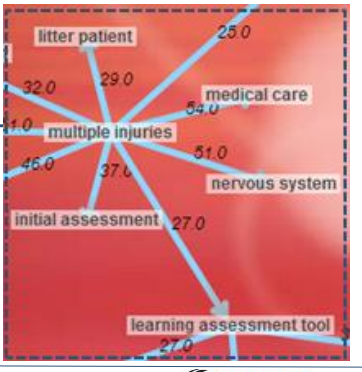


Screenshot from a prototype

ARL



- An example from virtual medic training.
- Source material consisted of manuals and PowerPoint



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Granule associated with a topic

Content from source materials

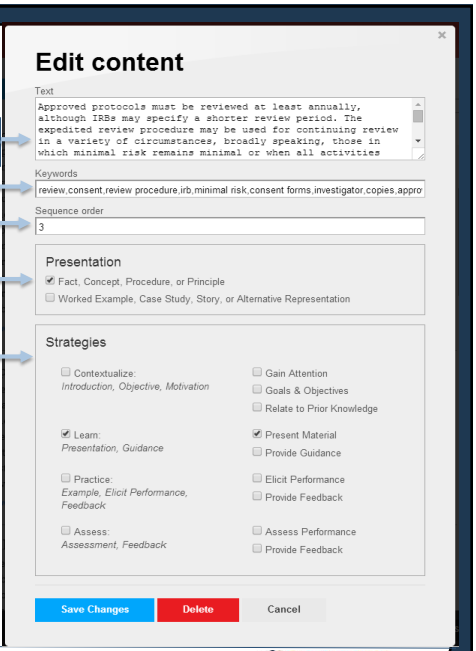
Auto-generated keywords

Sequence

Content classification

Pedagogical strategies

Example from Institutional Review Board (IRB) training required to conduct research with human subjects. Source material was chapter from CITI™ Program (Collaborative Institutional Training Initiative)



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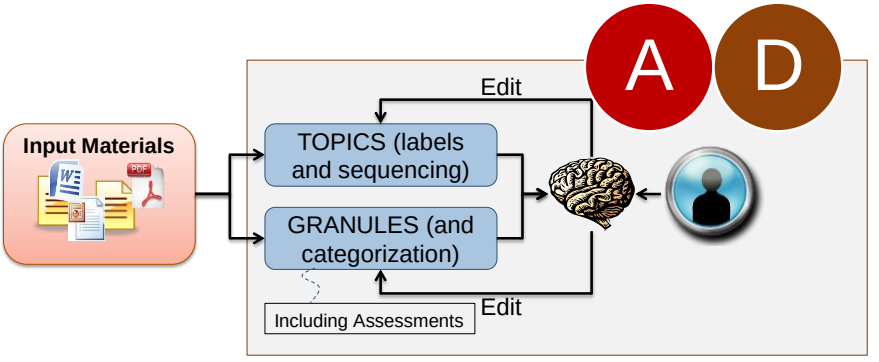
To err is human, to really foul things up requires a computer.

HUMANS IN THE LOOP

Computers are not perfect

- 80% accuracy is considered good in computational linguistics
- IBM Watson was brilliant … but thought Toronto was a US city
- Experts don't always agree either!



See also 202

A chance to talk about standards!

WHAT ABOUT DEVELOPMENT AND IMPLEMENTATION?

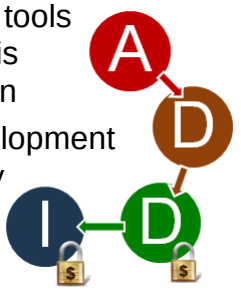
See also 302 See also 401

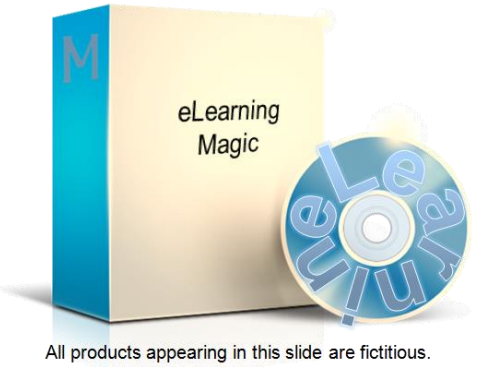
ADDIE and reuse

Is this an accurate description of your practices?

Traditional: Proprietary tools and formats.

- Development is done in a particular format using a set of tools
- Output is locked in
- Redevelopment is costly



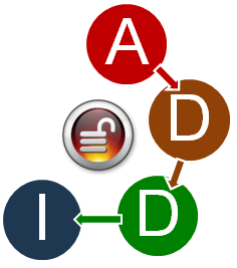


All products appearing in this slide are fictitious. Any resemblance to real products, living or dead, is purely coincidental.

See also 302 | See also 401

ADDIE and reuse

- Analysis and Design constitute **~35%** of ADDIE
- Including multimedia production **~58%**



Analysis and Design should result in data that can be reused in

- **Multiple delivery formats**
- **Multiple tools**
- **Multiple implementation environments**

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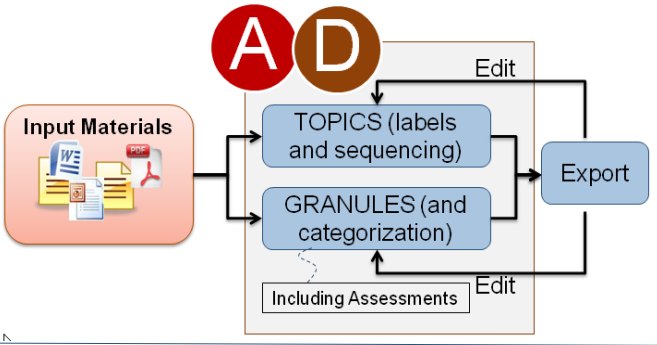
DITA | See also 302 | See also 401

Example Practices

- Export topics, associated granules (tagged with instructional strategies and pedagogical roles), questions, and sequencing to a **package** that can be used to rapidly develop eLearning using standard tools.



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Example Practices

DITA

See also 302

See also 401

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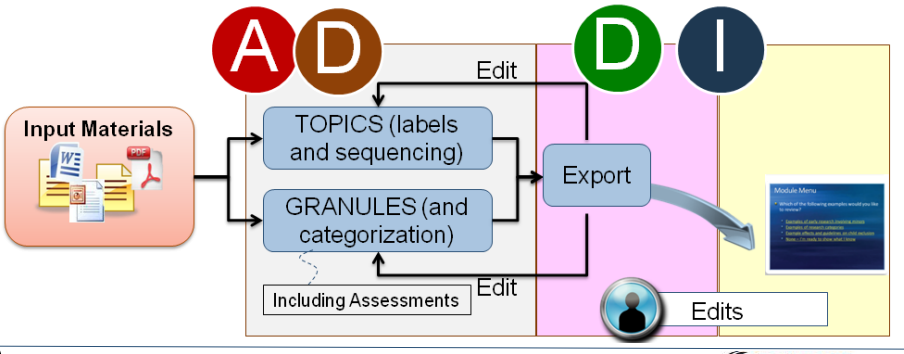

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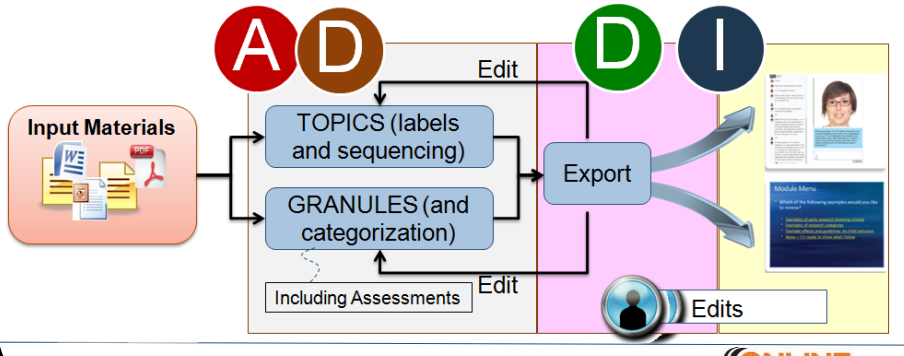
Example Practices

DITA

See also 302

See also 401

- Export topics, associated granules (tagged with instructional strategies and pedagogical roles), questions, and sequencing to a package that can be used to rapidly develop eLearning using standard tools.
- JavaScript Object Notation (JSON) that can be read by a dialogue-based intelligent tutoring system.



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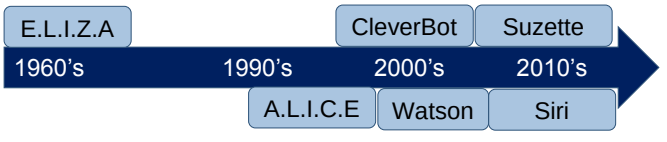
But … Siri-ously now …

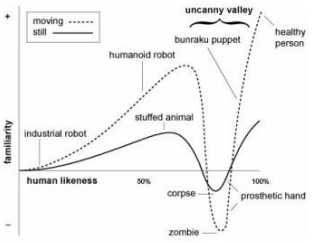
A FEW WORDS ABOUT CONVERSATIONAL AGENTS

Chat Bots and Avatars …



Positive results for learning

Beware the uncanny valley



Mori, M., MacDorman, K. F., & Kageki, N. (2012). The uncanny valley [from the field]. *Robotics & Automation Magazine, IEEE*, *19*(2), 98-100.

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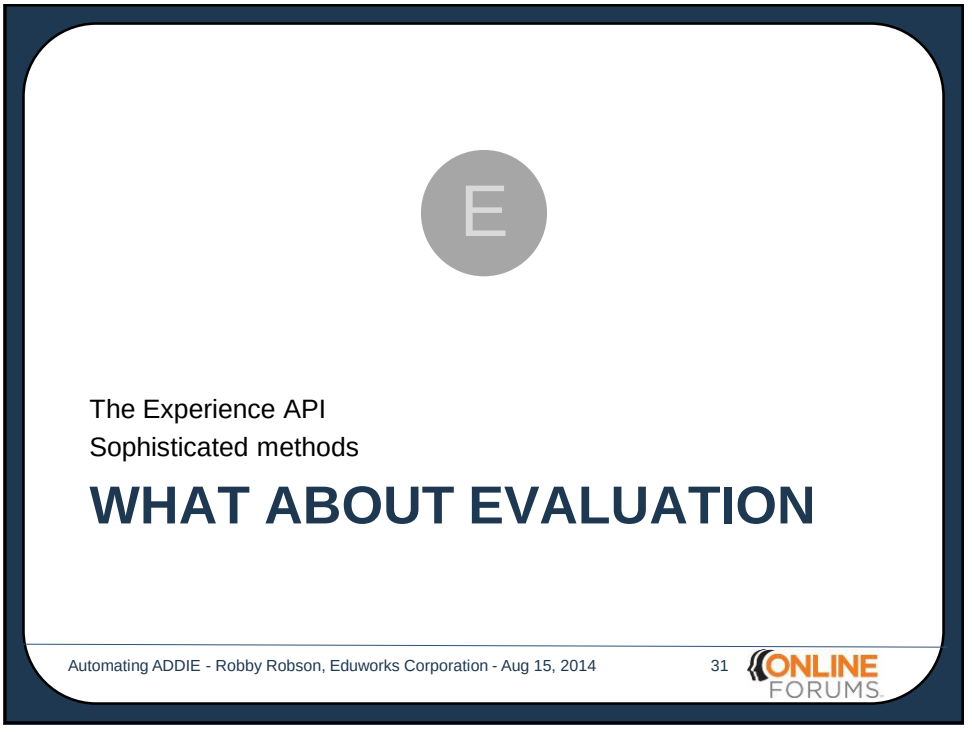
- Wolfe, C. R., Widmer, C. L., Reyna, V. F., Hu, X., Cedillos, E. M., Fisher, C. R., . . . Weil, A. M. (2013). The development and analysis of tutorial dialogues in AutoTutor Lite. *Behavior Research Methods, 45*(3), 623-636.
- Zhou, Y., Freedman, R., Glass, M., Michael, J. A., Rovick, A. A., & Evens, M. W. (1999, 1999 / 01 / 01 /). *Delivering hints in a dialogue-based intelligent tutoring system*.

Here to stay

- Increasingly serving as a UI
- **Driven by gamification and mobile learning**
- Increasingly intelligent – able to interpret language, execute conversational gambits, remember past discussions …

What are the Implications for managing and reusing content?


E
The Experience API
Sophisticated methods
WHAT ABOUT EVALUATION
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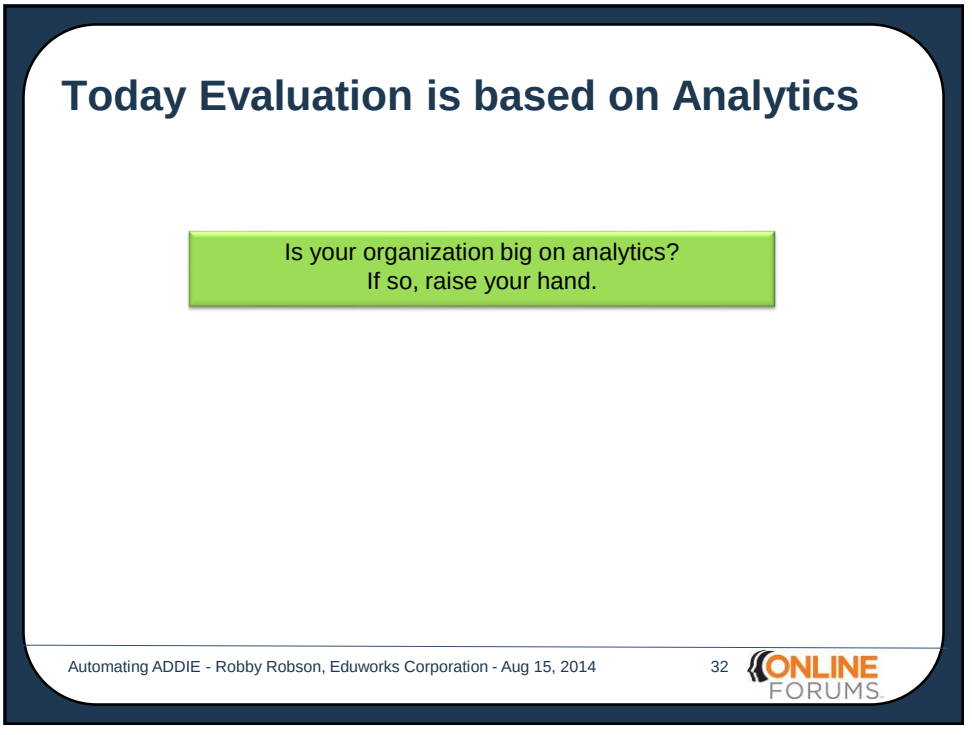
Today Evaluation is based on Analytics
Is your organization big on analytics?
If so, raise your hand.
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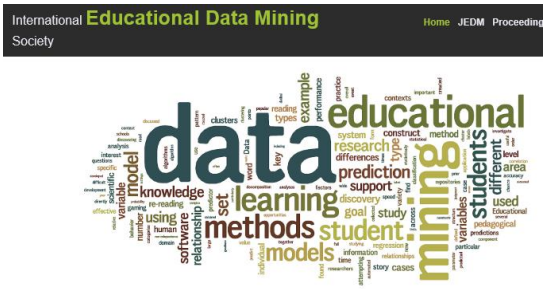
Today Evaluation is based on Analytics

- "LMSs in 2014 and into 2015 … will leverage network effects, advanced analytics capabilities, and a seamless user experience across content and devices." (http://edutechnica.com/2014/01/07/a-model-for-lms-evolution/)
- "Big data for learning incorporates every data point across the organization, including …demographics, feedback, course starts/completions, test results, skill levels, performance reviews, course access points, time on system, clicks and scrolling." (http://www.trainingmag.com/content/growth-learning-analytics)



Analytics (and evaluation) require data!

- Level 1 and level 2 evaluation (student attitude, measured effects on learning) currently come from LMS
- Important update

EXPERIENCE API™ — Branded in some markets as "tin can"

- The xAPI reports and retrieves learning activities
- Major LMS and authoring systems support the xAPI
- The xAPI is built for learning analytics

Reusing Analysis and Design
Managing Development and Implementation
Instrumenting for Evaluation

PRACTICAL SOLUTIONS

See also 401 See also 402

Analysis and Design

- BASIC APPROACH
  - Save analysis and design in a format that can be shared
- TECHNO-APPROACH
  - Extract analysis and design from existing source materials
- RECOMMENDED PRACTICE
  - Package assets, dialogues, text, objectives, questions, etc. in portable format
- BE AWARE
  - Automation is imperfect
  - Quality upfront is time well invested
  - There are no standards

Task	ADDIE	% of Total Effort	Hours Required	
			Level 1 -	Level 3
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Pilot Test	DI	4%	5	20
Other	(E)	2%	1	2
TOTAL		100%	80	500

See also 101 | See also 202 | See also 302 | See also 401

Development and Implementation

- BASIC APPROACH
  - Templates and existing tools
- TECHNO-APPROACH
  - Leverage frameworks and advanced technologies
- RECOMMENDED PRACTICE
  - Keep development flexible, even if you only use one tool today
  - Implement reporting (xAPI)
- BE AWARE
  - Humans still need to be in the loop
  - Cultural change is a major barrier to reuse
  - Technical challenges with LMS implementation

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Evaluation

- BASIC APPROACH
  - Standard reporting data
- TECHNO-APPROACH
  - Educational Data Mining (includes methods such as Clustering, Predictive Analytics, and Structural Equation Modeling*)
- RECOMMENDED PRACTICE
  - Gather data!
- BE AWARE
  - Analytics is a fast-growing area
  - Content can be designed to improve analytics … not part of this presentation!

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* Bollen, K. A. (1998). *Structural equation models*. John Wiley & Sons, Ltd.

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