

7 Development of Learning Applications

7.1 Structure of Development Processes

7.2 Preliminary Analysis

7.3 Design: Didactic Concept

7.4 Design: Storytelling 

7.5 Design: Segmenting & Sequencing

7.6 Design: Interactivity & Adaptivity

7.7 Development Tools and Platforms

References:

Roger C. Schank: Lessons in Learning, e-Learning, and Training, Wiley/Pfeiffer 2005

William Horton: E-Learning by Design, Wiley/Pfeiffer 2006

Meta-Remark

In case you wonder about the style of slides:
Yes, these slides are meant for students actually attending the lecture.

Jerome Bruner on Storytelling

"THE TWO MODES
OF KNOWING ARE
ARE IRREDUCIBLE
TO ONE ANOTHER"
JEROME BRUNER

- “There are two modes of cognitive functioning, two modes of thought, each providing distinctive ways of ordering experience, of constructing reality.”
- *Paradigmatic, logico-scientific* mode
- *Narrative* mode
- Jerome Bruner, *Actual Minds, Possible Worlds*, Harvard University Press 1986
 - <http://www.creatingthe21stcentury.org/Intro3-Narrative&abstract.html>

Benefits of Storytelling

***What do you think are benefits of storytelling
– in E-Learning?***

to be filled in lecture

See also

<http://www.creatingthe21stcentury.org/Intro6-benefits-story.html>

Ten Rules for Storytelling (Schank)

1. Use real stories
2. Never tell without using a story
3. Make sure the tellers are authentic
4. Make sure the tellers do not blandify the story
5. Include the "story choice" as part of the story
6. Tell only those stories that can be heard
7. Tell stories just in time (for the audience!)
8. Recognize that story living is better than story telling
9. Surprise your listener
10. The story is chosen as it is created.

Types of Stories

Which general ways exist about making use of stories in teaching?

to be filled in lecture

Example Story (Horton)

- Denise's story:

“About 2 years ago I was living in Boston and I took the subway to work every day.

One Monday, when I went into Park Street station, it was littered with newspaper – newspaper everywhere. I stepped over, around, and through the paper, but I certainly didn't look at it.

Standing not too far from me, waiting for his train, was a middle-aged man. He was looking around at the mess and then looked down at his feet. He bent down, picked up some of the newspaper and took it to the trash. He did this a few times until his train arrived.

After the train was gone and the station had quieted down a bit, a young woman on the platform bent down and picked up some newspaper at her feet and took it to the trash. Then a young man did the same thing. Finally, we were all in the act. By the time my train arrived, the station looked pretty good – and the trashcans were full.”

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Segmentation and Learning Objects

What is a natural partitioning of learning material?

What are natural units (objects) for learning?

to be filled in lecture

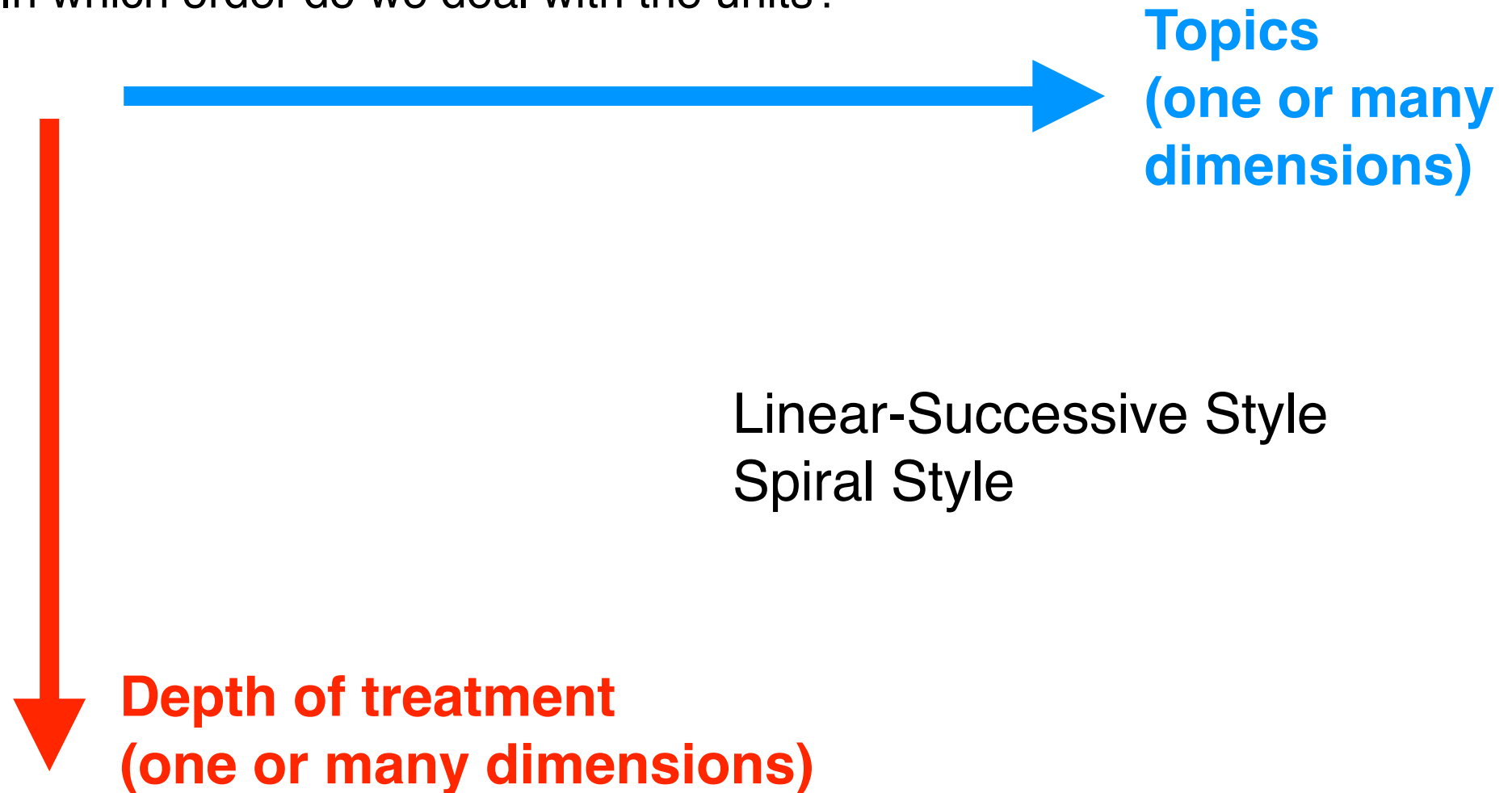
Segmentation and Learning Objects: Example

Natural partitioning for the following topic?

Topic: Concepts of imperative programming
(Variable, expression, assignment, if-then-else, while)

Patterns of Sequencing

- Assuming, we have a collection of learning segments/objects
- In which order do we deal with the units?



Patterns of Sequencing: Example

- Topic: Digital Media/Media Technology
(digital sound, images and moving images: recording, rendering and storage formats)
- *Name possible dimensions of the topic space!*
- *Which of these dimensions are suitable as primary dimensions for structuring the material?*
- *Which are sub-dimensions?*
- *Which are orthogonal to which others?*
- *Which are suitable for structuring depth of treatment?*
- *Give examples for different possible sequences of treatment!*

Alternative to Hierarchical Analysis: Elaboration Theory

- Reigeluth 1999: Simplifying Conditions Method (SCM)
- *Epitomizing*: Finding the simplest version of the task which is still representative for the problem
- *Elaborating*: Teaching increasingly complex versions of the task
- ***Try to apply this idea to teaching the concept of a procedure/function in imperative programming!***

http://edutechwiki.unige.ch/en/Elaboration_theory

Choice of Sequencing Method

to be completed in lecture

- ***Which sequencing method is appropriate for these two example topics?***
 - Case 1: Lossy image compression with JPEG
 - Case 2: Basic skills in digital video editing

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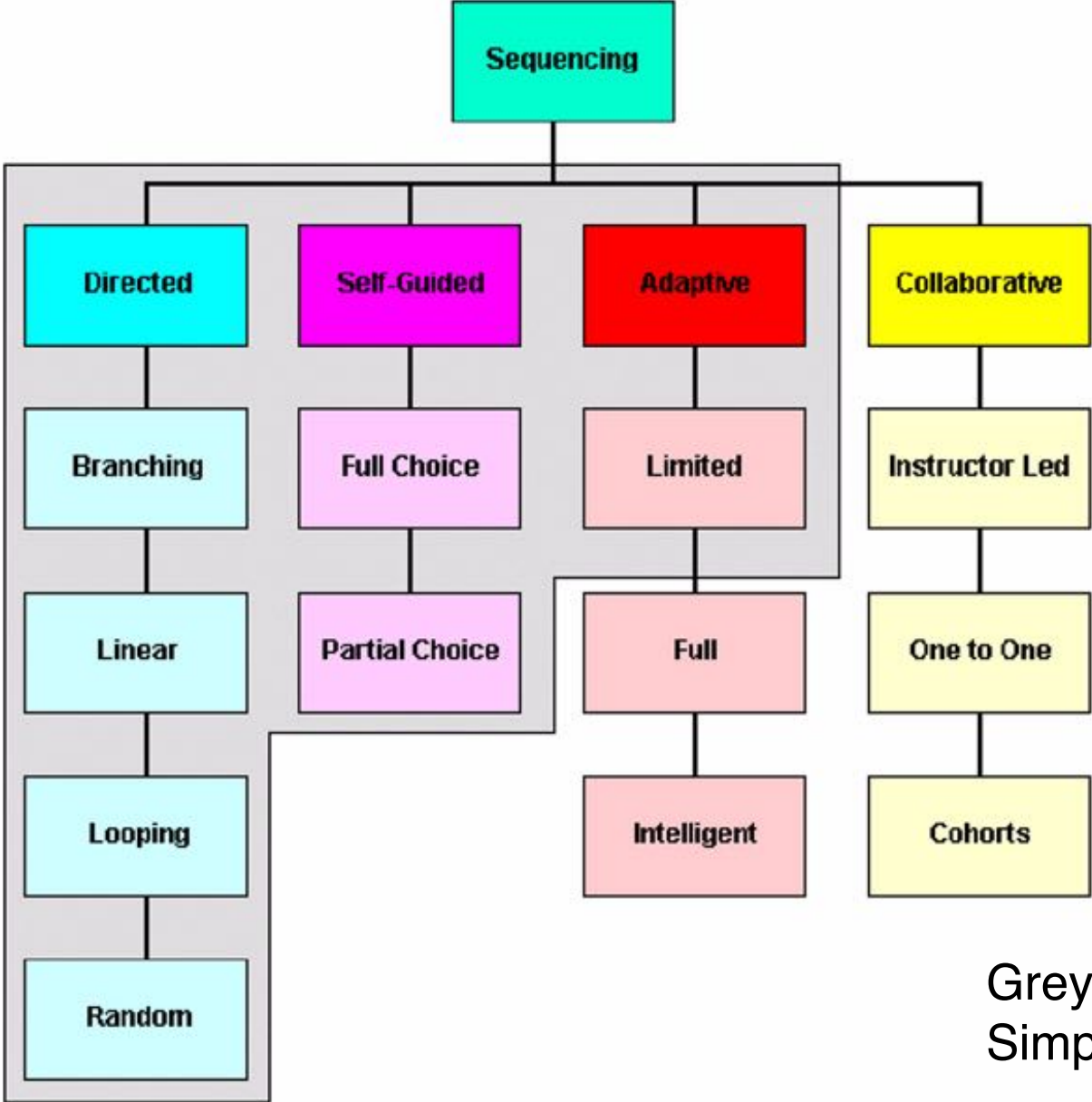
References:

IMS Simple Sequencing Best Practice and Implementation Guide, v1.0,
imglobal.org

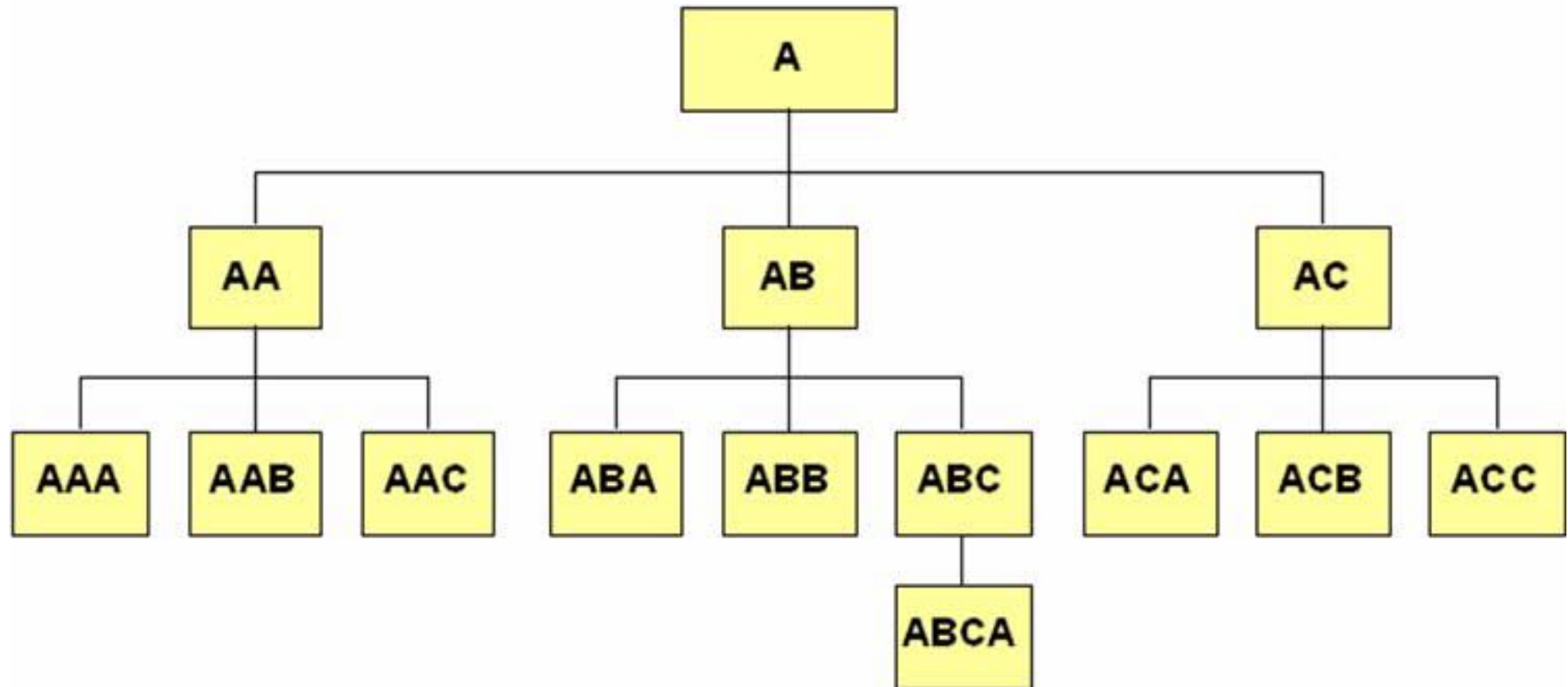
IMS Simple Sequencing

- IMS Global Learning Consortium (imglobal.org)
 - Originally "Instructional Management Systems" project (1997)
 - Global non-profit organisation, 250+ members
 - Defines and publishes learning technology standards
 - For instance: IMS Content Packaging
- IMS Simple Sequencing (v 1.0, 2003):
 - Representation of sequencing for learning activities
 - Covers interactivity and adaptation:
Different paths through tree of learning objects
 - Abstract data structure together with XML binding
- Similar standardization initiative: SCORM
 - Sharable Content Object Reference Model
 - Advanced Distributed Learning Initiative (adlnet.org),
founded by U.S. DoD
 - Aktuelle Version: SCORM 2004 4th edition (2009)
Sub-standard "Sequencing and Navigation" (SN)

Problem Space of Sequencing

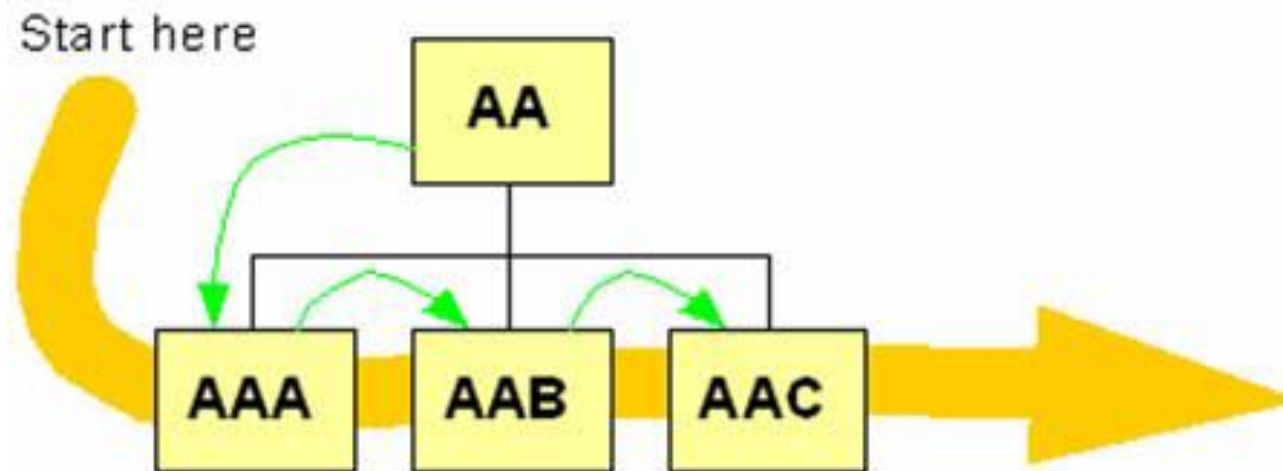


Activity Tree



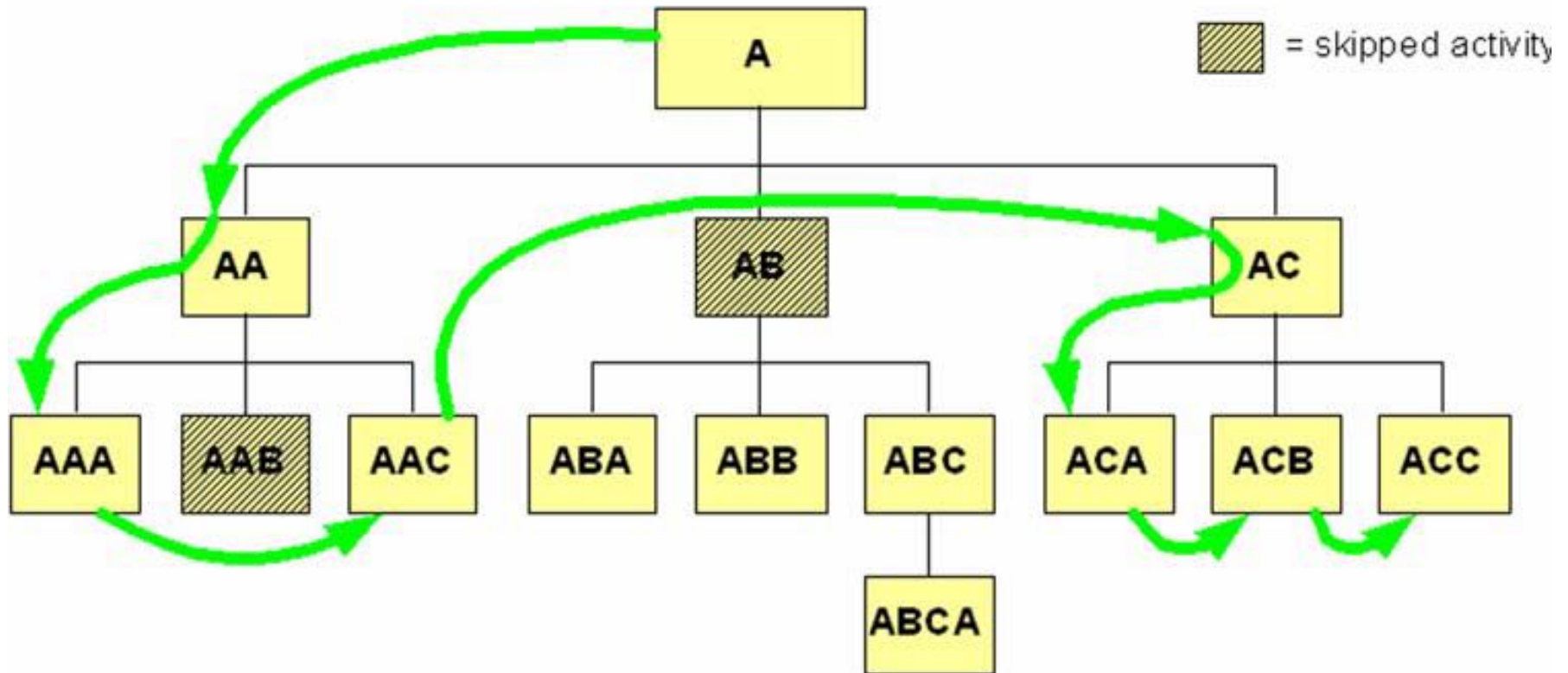
Navigation Control Modes

- Default: Learner can choose any activity in a cluster (sub-tree)
- Rule associated with parent node defines flow through sub-activities



**Enabling forward flow for activity AA.
The learner sees AAA, AAB, then AAC.**

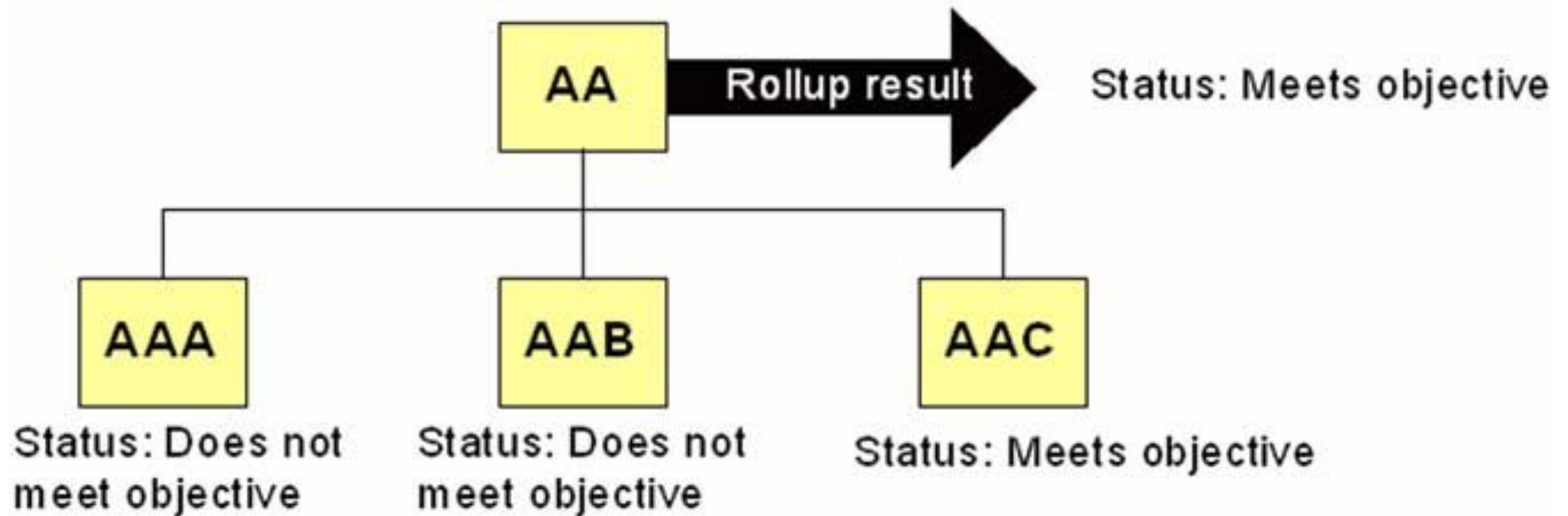
Rule-Based Sequencing - Conditional Rules



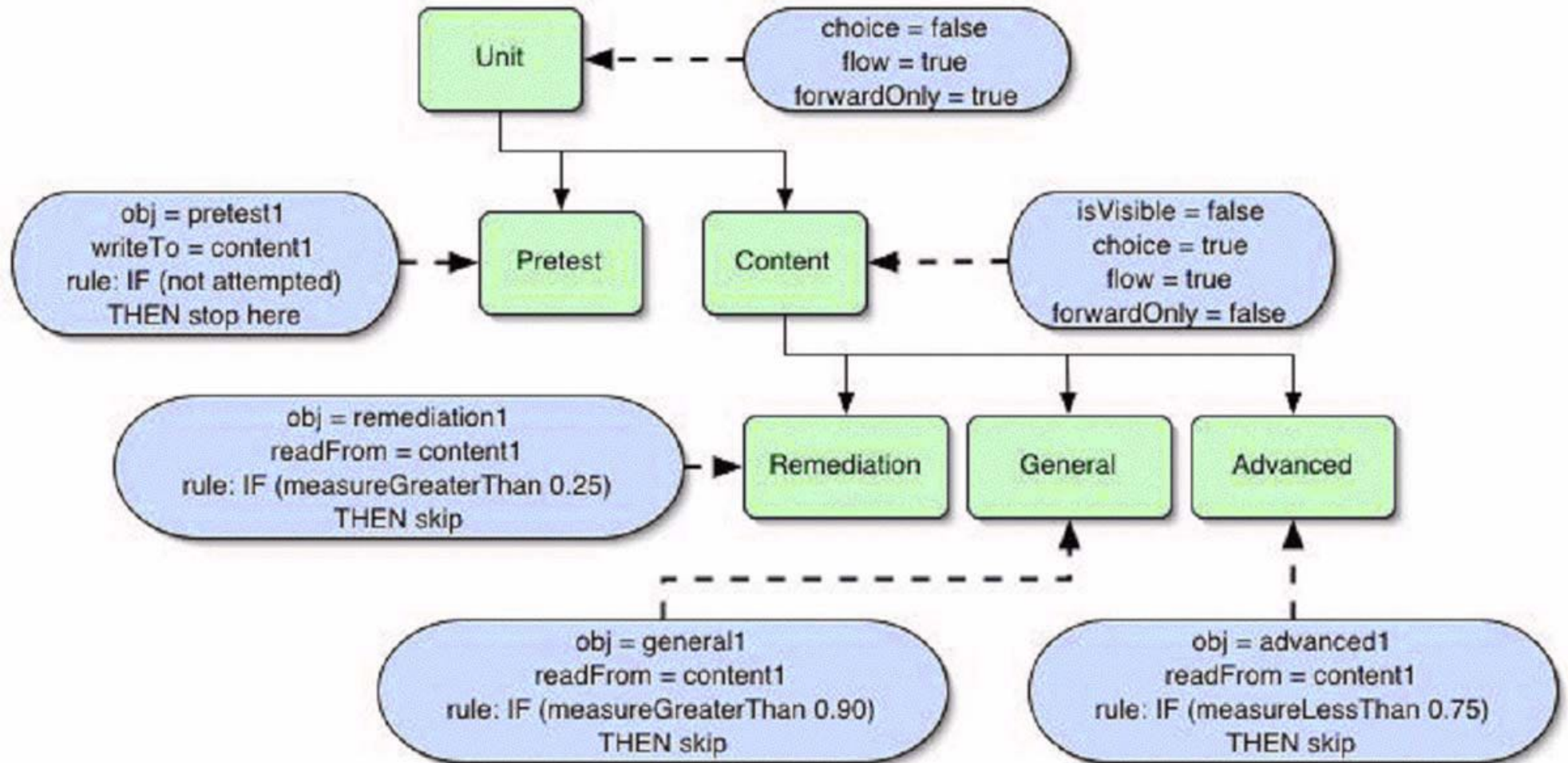
Specific nodes have a rule that specifies that they should be skipped under certain conditions

Rollup Rules: Tracking Results of Activities

Rollup rule: Meets objective if any child meets its objective



Example: Basic Sequencing Behavior



Dimensions of Adaptation

Which further possibilities for adaptation do we have in e-learning systems – beyond adapting the sequencing?

to be filled in lecture

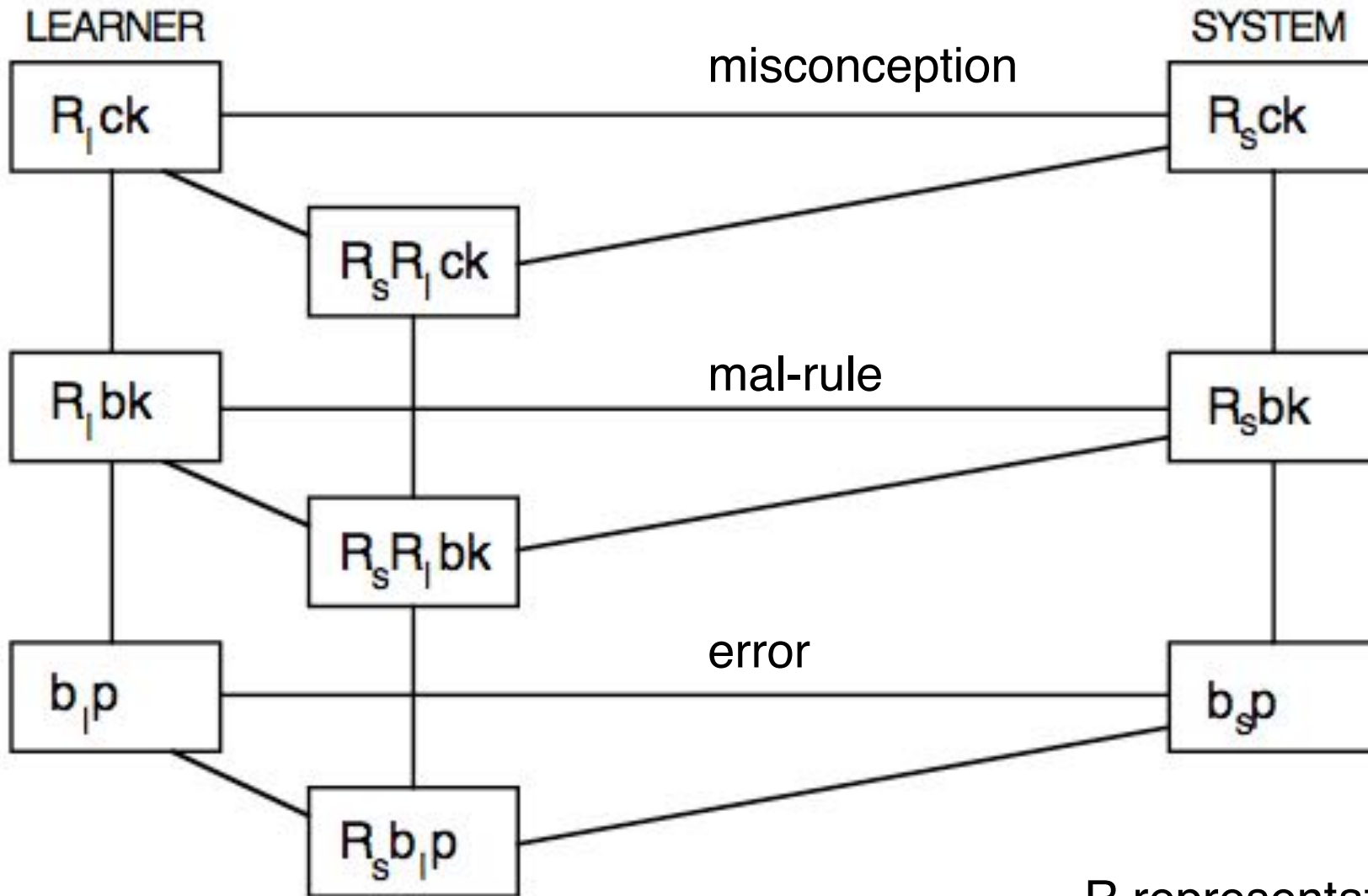
Dillenbourg/Self: Two-Dimensional Framework for Learner Modeling

- Vertical dimension (problem domain):
 - Problem domain is a triple $\Omega = (P, B, Solution)$ where
 - » P is the set of problems
 - » B is the (large!) set of possible agent (learner/system) behaviors
 - » Behavior b of agent a on problem p : b_{ap}
 - » *Solution* is a relation between P and B
 - *Behavioral knowledge* of the domain (bk)
 - » Inference structure to infer some behavior for a given problem
 - *Conceptual knowledge* of the domain (ck)
 - » Definition of the concepts underlying the behavioral knowledge
 - » May exceed actual problem domain
- Horizontal dimension:
 - Discrepancies between the same entities possessed by different agents

Pierre Dillenbourg and John Self: A Framework for Learner Modelling.

Interactive Learning Environments, 2, 111-37 (1992), available from <ftp.comp.lancs.ac.uk>

Dillenbourg/Self Model



R representation
l/s agent (learner/system)

Learner Modeling

- Stereotype model:
 - Learner is assigned to one out of a number of predefined classes
- Differential model:
 - Characterizing the learner knowledge by its difference to the system knowledge
 - » Misconception: Discrepancy at conceptual level
 - » Mal-rule/bug: Systematic discrepancy at behavioral level
 - » Error: Isolated discrepancy at behavioral level
- Overlay model (Carr/Goldstein 1977):
 - Model of knowledge (concept network), degree of coverage
- Perturbation model:
 - Coverage of knowledge (like in overlay model), plus
 - Model of learner's faults (like in differential model)
- Concrete representation: E.g. feature vectors

6 Entwicklung von Lernanwendungen

6.1 Schritte eines Entwicklungsprozesses

6.2 Analyse für Lehr- und Lernanwendungen

6.3 Design: Didaktisches Grundkonzept

6.4 Design: Storytelling

6.5 Design: Segmentierung, Sequenzierung

6.6 Design: Interaktivität und Adaptivität

6.7 Entwicklungswerkzeuge



Literatur:

Issing/Klimsa (ed.), Kap. 13 (H. Freibichler)

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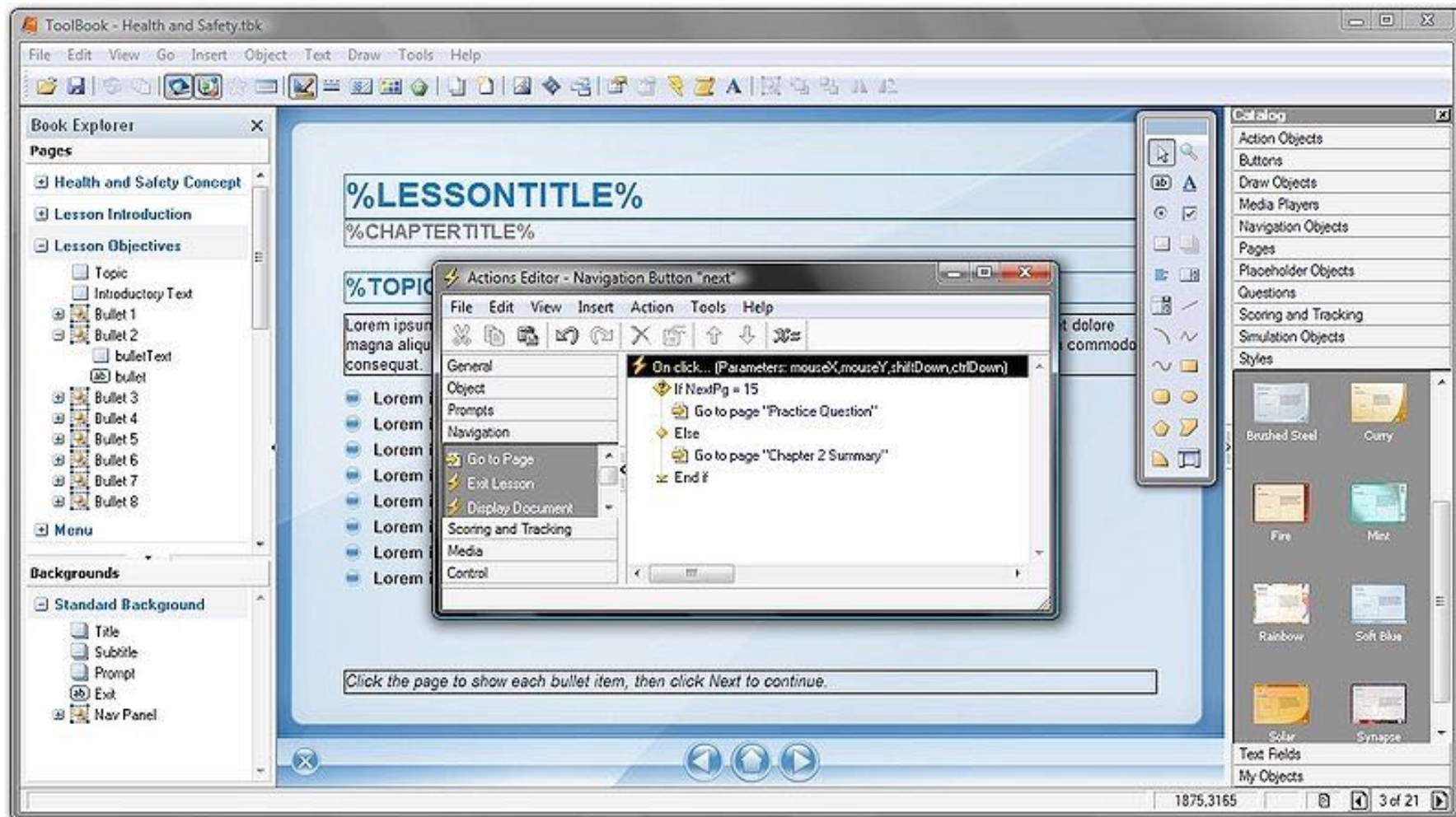


Main Types of Authoring Systems

- Frame-based development
 - Legendary predecessor "HyperCard", nowadays PowerPoint paradigm
 - Well-known product: *SumTotal ToolBook*
- Flow-based development
 - Extended control flow diagram
 - Well-known product (*no longer available*): *Adobe AuthorWare*
- Timeline-based development
 - Stage and actor metaphor
 - Famous (but legacy) products: *Adobe Director, Adobe Flash*
- Interactive demonstration videos
 - "Screencasting", combined with live audio and video
 - Well-known products: *TecSmith Camtasia*
- Hybrid products:
 - *Adobe Captivate*: Screencasting + frame-based
 - *Articulate Storyline*: Flow diagram + timeline

SumTotal ToolBook

- Company *Asymetrix*, founded by Microsoft-co-founder Paul Allen
- Since 2004 company name *SumTotal* (now a *SkillSoft* company)



Authorware

- Developed by a PLATO collaborator, product since 1987
- Macromedia 1992, Adobe 2005

Adobe Authorware 7



Produce rich-media courseware for e-learning

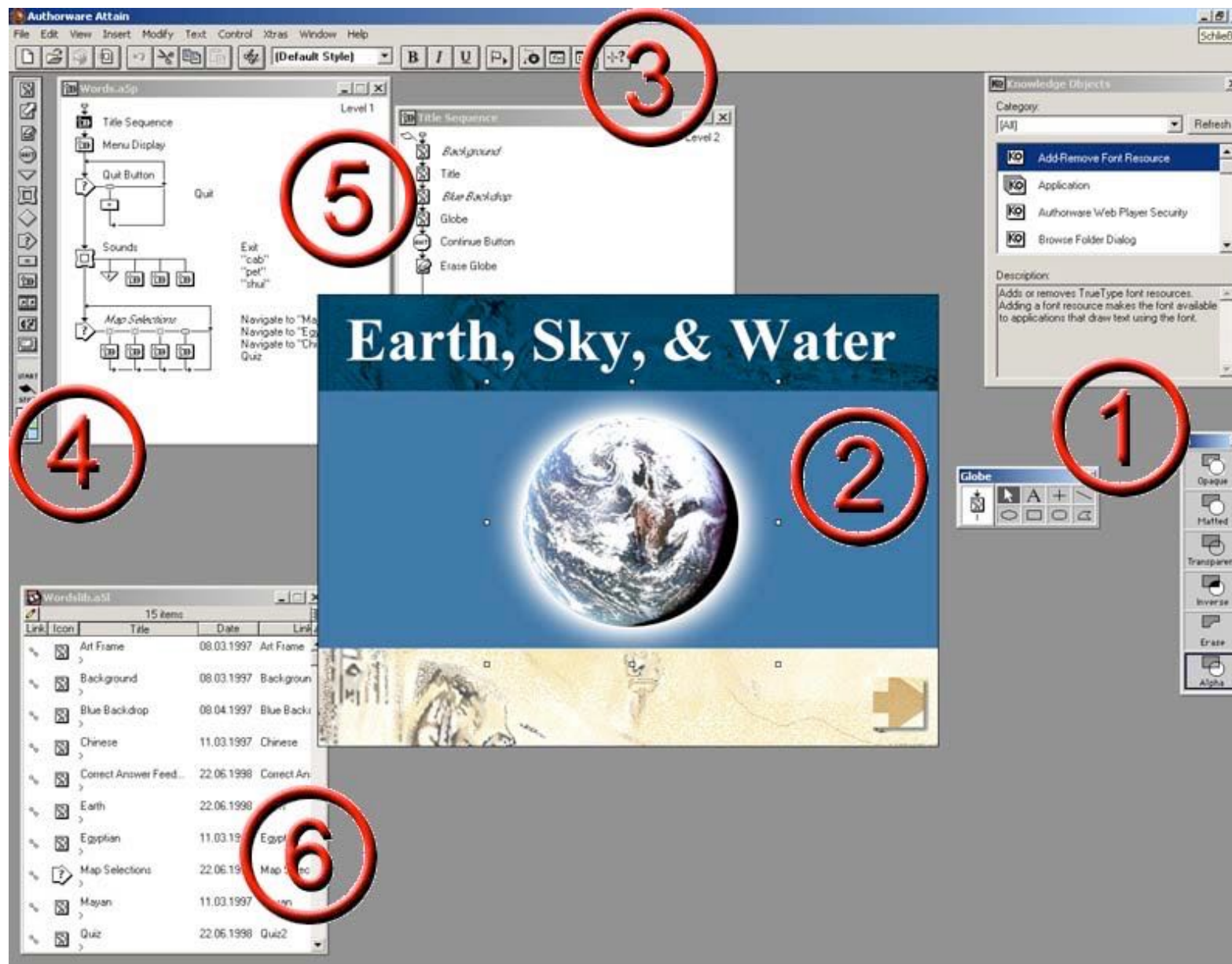
[Buy or upgrade Authorware 7 ›](#)
[See top 10 Reasons to upgrade ›](#)
[Take a tour of the features ›](#)
Order by phone: 1-800-585-0774

Why does Adobe plan to discontinue development of Authorware?

The eLearning market has transitioned to Adobe Flash® and Adobe Captivate® software over the years. Authorware is a mature product and demand has continually declined to where it is no longer economically viable for Adobe to continue development.

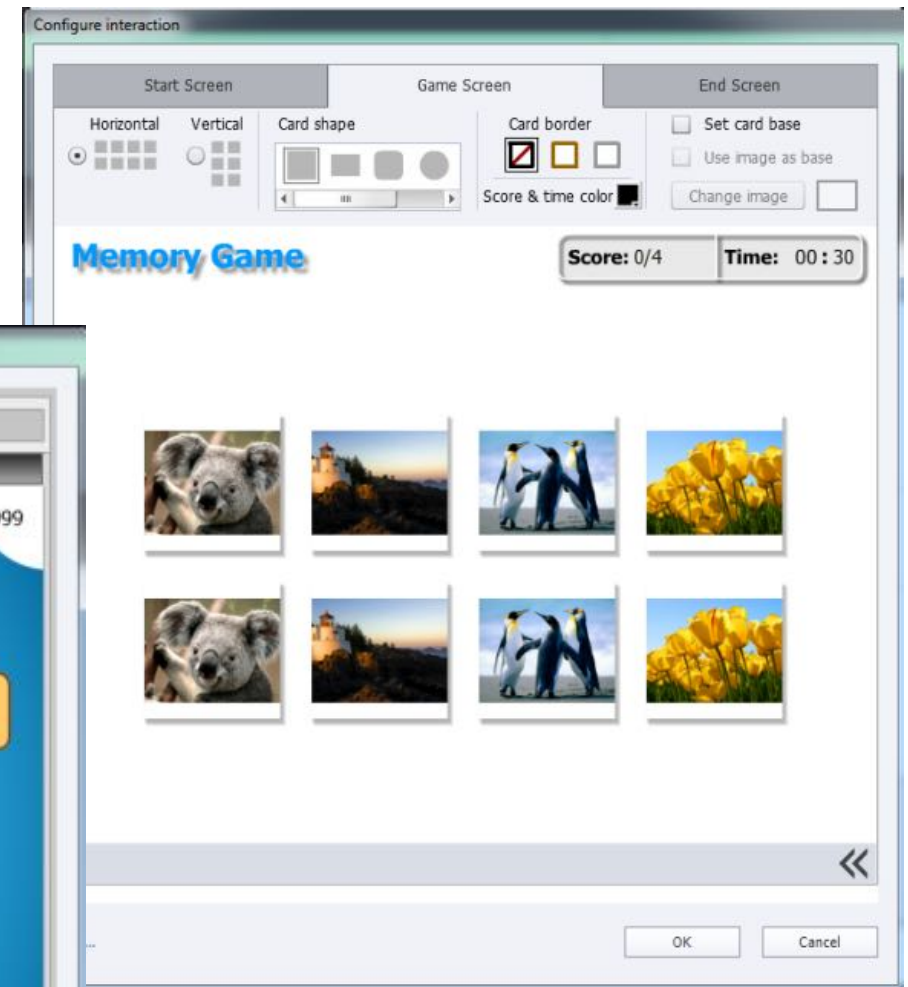
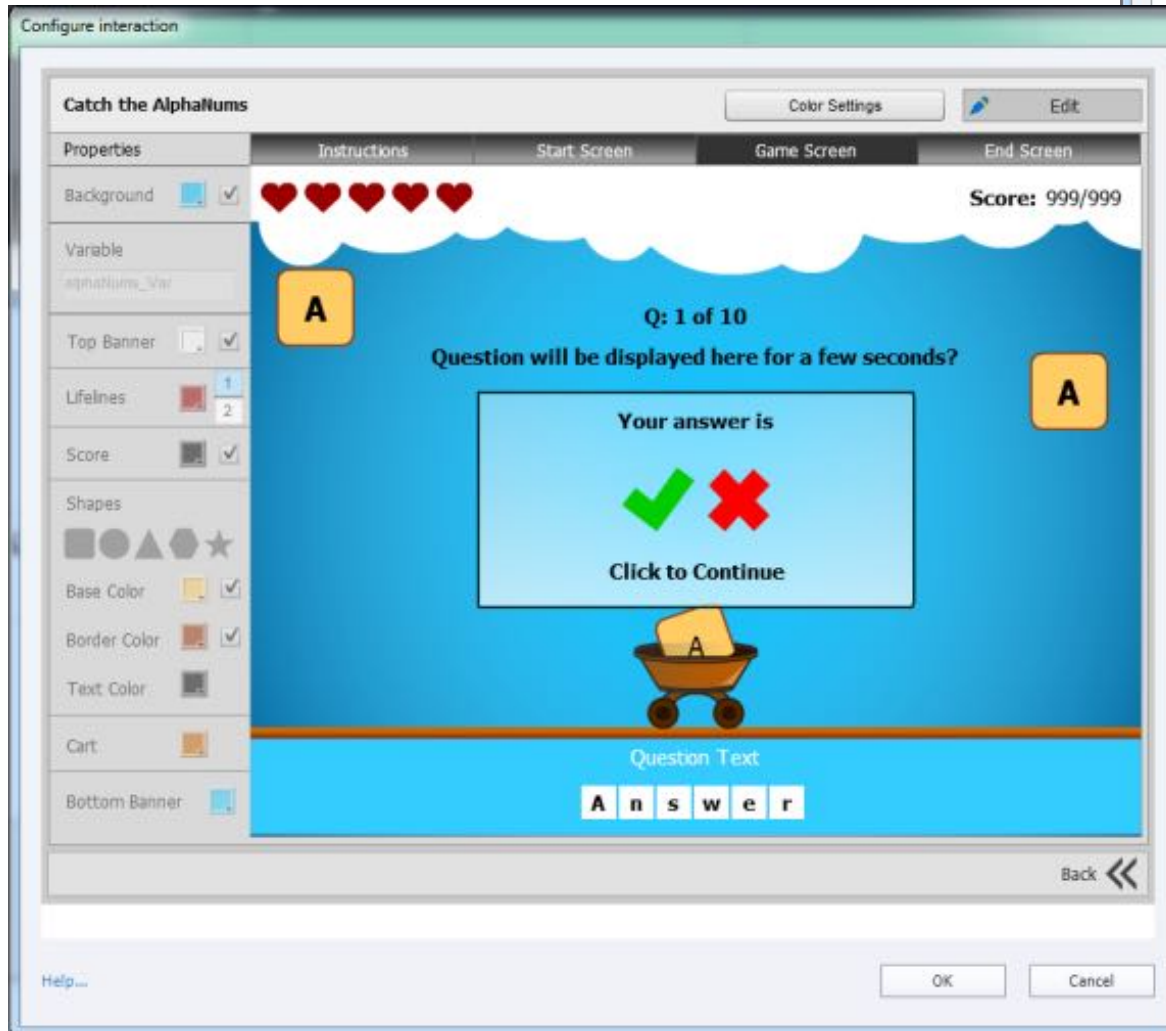
August 2007

Authorware Screen



- 1 Work area
- 2 Presentation Area
- 3 Menu bar
- 4 Icon-Palette
- 5 Design window
- 6 Library

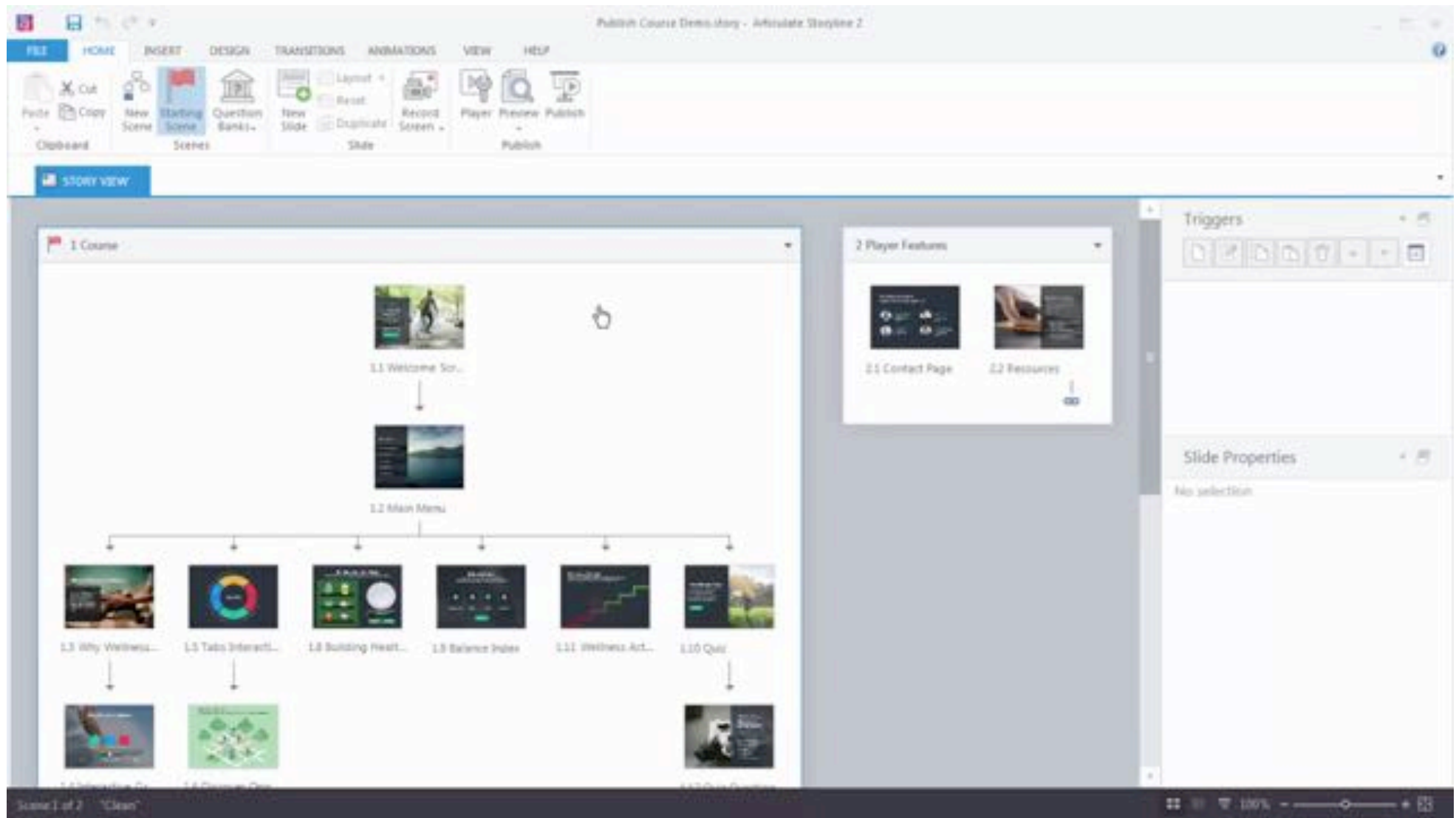
Adobe Captivate



From screen casting
to design of interactive
dialogues and simulations

Source: Adobe

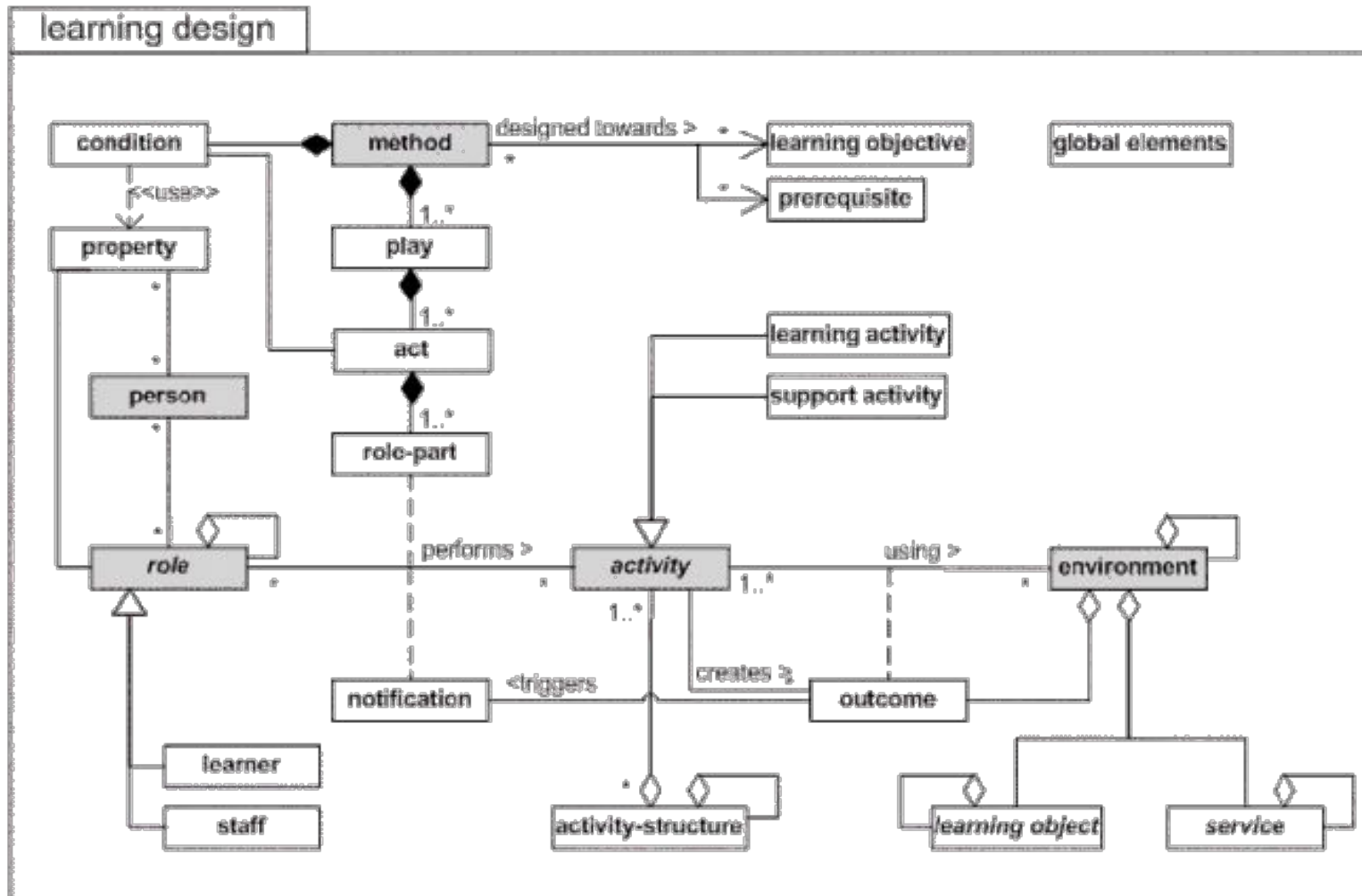
Articulate Storyline 2



www.youtube.com/watch?v=Brg3RyZ0_To

IMS Learning Design (LD): Standard for Representing Pedagogies

- "A generic and flexible language designed to enable many different pedagogies to be expressed"



UML
meta model

Trends

- Mobile devices, tablets
 - Responsive content
 - Touch input
- Web-based delivery
 - HTML5 export
- Location-adaptive learning