Storyboarding Concepts for Edutainment WIS

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Klaus-Dieter Schewe & Bernhard Thalheim
Massey & Kiel Universities,
New Zealand & Germany
Overview

- Challenges to edutainment and our proposal for resolution deficiencies, misunderstandings, misconceptions
- Dimensions and characterizations of edutainment WIS
  Brand of WIS
  - Intention: application area, users with profile and portfolio, tasks
  - Context: culture, environment, history, provider
  - Storyboarding: sophisticated didactics for story space
  - Content chunks: learnable units and elements for everybody, at any place, on information demand
  - Functionality: functions and adaptation for the current user and progress
  - Presentation: layout and playout to the right place and device
- Edutainment: easy-to-grasp and special knowledge within communities
Challenges to Learning Systems (1)

What is learning? Stories of learning?

Sequenced learning: curriculum sequencing in active (shopping bag) or passive (tutoring) scenarios based on classical pedagogical approaches (conditioning, operated learning, model learning, cognitive approaches) and within classical didactics

Interactive learning either in self-organized or content-sequenced or habit-regulated or publish-subscribe scenarios

Group learning in a cooperative setting (integrated sub-tasks, black boarding) or in a collaborative setting (cooperation, discussion, development of solution by all members)
Challenges to Learning Systems (2)

Kinds of knowledge and information? Content?

- knowledge and abilities for **orientation**
  explanation, presentation, history, facts, surveys, overview

- knowledge and abilities for **application, skills, abilities**
  rules, procedures, principles, strategy, laws

- knowledge and abilities for **explanation**
  why (proof, causal), what (definition, description, case, argument, assumption, reflection)

- knowledge and abilities on **sources**
  archives, documents, citation, reference, links

- knowledge and abilities for **solving problems**
  sample solution, analogs, training solutions, discovery solution, examination
Challenges to Learning Systems (3)

Content $\neq$ data

Information as processed by humans, is data perceived or noticed, selected and organized by its receiver, because of his subjective human interests, originating from his instincts, feelings, experience, intuition, common sense, values, beliefs, personal knowledge, or wisdom simultaneously processed by his cognitive and mental processes, and seamlessly integrated in his recallable knowledge.

Knowledge is justified true belief and understanding

Skills as ability to do something well

T. S. Eliot (1888-1965), The rock, 1934:
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
Where is the information we have lost in news?
Where is the information we have lost in data?
Challenges to Learning Systems (4)

Broad variety within three dimensions

Intelligent Content Support

- historical and previous units + forecast
- historical and previous units
- no historical but previous units
- no historical/previous units

Learner A Learner B

Teacher

Moderator

Advisor

Reviewer

Derived then: supporting workspace

with a many-dimensional role of the learner
Challenges to Learning Systems (5)

- Simplistic understanding of the learner
- All objects independently of the learner

Background knowledge lead to different speed, reception
Work abilities and habits influence current work
Learning style in many facets

- Social environment with cultural, psychological differences
- History of the learning process without annoying repetitions
- Learning portfolio influences occasion, intention and motivation

Learning object presentation is or is not acceptable
Learning environment with all technical facets
Content change management with or without refresh
Payment profile with content reduction
Challenges to Learning Systems (6)

Storyboarding and didactics?

Critical-constructive didactics as learning through interaction via goals (Klafki)

Learn-theoretical didactics through dialogues between actors (Schulz)

Goal-oriented learning with sub-processes (Möller)

Cybernetical didactics with regulated processes (v. Grube)

Critical-constructive didactics based on interactions, repetitions, obstruction (Winkel)

Curriculum planning with schedules, goals, steps

Novel didactics with a large variety of trials
Our Approach and Success Stories

Learning in real life projects

- **KoPra**: Cooperative problem solving for database courses
  learners in roles: problem solver, corrector, advisor
  collaborative programming problem solution
  evolving story space exploration

- **DaMiT**: The data mining tutoring system
  data mining based on own or foreign data, own or foreign algorithms
  learning by doing
  understanding analysis outcome and hypothesis impact
  open learning units

- **Learning Lusitia**: Continuing education for alumni, elderly people, unemployed, ...
  profile- and portfolio based
  variety of learning tasks
  learning space

**Best-suited content** just in time just for current payment to the right place and device
Brand of WIS

$P^W_{2U^A}$ (Provider $P$, knowledge $W$, user $U$, activities $A$) generalises the classical who-to-whom pattern (e.g. B2B)

**Provider**: educational institutions, educational communities; commercialisation; teacher.

**Product dimension**: easy-to-understand information or easy-to-grasp knowledge;
corresponding functions, e.g. validate, control and advice.

**User dimension**: private people, pupils or students, people seeking for continuing education, workers in companies with specific portfolio, ...

**Activity dimension**: centered around learning, searching for content, collecting content, solving exercise, ask questions, act in teams

Teacher, 2Student
contentchunks receive, respond, solve_in_teams, raise_questions, possibly_apply

Teacher, 2Student
contentchunks recognise, listen, work_on_it, solve_exercises, ask_urgent_questions

Teacher, Knowledge 2Student
Knowledge discuss, get_feedback, work_on_it

Teacher, Knowledge 2Student_Group
Knowledge discuss, get_feedback, work_on_it

Teacher, Wisdom 2Student
Wisdom discuss, get_feedback, work_on_it
The WIS Specification Framework

The WIS Hexagon

- users and their intention
- context: environment, organization
- content: data, content objects, knowledge, concepts, ...
- presentation
- functionality: navigation, search, ...
- storyboard: stories, tasks
- goals, application area, profile, information demand
- interfaces depending on infrastructure

Media types
- WIS
- Story
- Actor

WIS Engineering
Six Dimensions
Intention
Context
Storyboarding
Content Chunks
Functionality
Presentation
Concluding
Explicit Consideration of Edutainment Application Areas

User-centered approaches with user profile, portfolio and information demand

Knowledge domain for edutainment content-dependent presentation,
considering also association, concepts, annotation

Life cases of edutainment depending on life circumstance, knowing the culture

Problem solution approaches based on success cases, illustrations, animations

Collaboration among users with their information rooms, their exchange, their communication, coordination and cooperation
Explicit Specification of the Intention

Towards Pragmatics of Storyboarding

Intention space: \{intention name\}
Purpose: \{outcome description\}
Aims: \{list of aims\}
Objectives: \{list of objectives\}
Intents: \{outcome description\}
Targets: \{list of weighted targets\}
Objects: \{list of weighted objects\}
Themes: \{class of intents\}
Time: \{outcome description\}
Design: \{general flow\}
End: \{effects, termination conditions\}
Occasion: \{list of objectives\}
Representation: \{general style guide\}
Atmosphere: \{general description of atmosphere\}
Metaphors: \{list of metaphors\}
Based On: \{tasks, audience, mission, goal\}
Users and Their Intentions

Profile and Portfolio

Pupil: Obtain knowledge through teachers, their schedules, their abilities

Collaborating or cooperating student with collaboration or cooperation profile and rights and roles

Communication partners for exchange of content, for question answering, for hints, for better understanding

Supporting and motivating partners with control, motivation and supporting functions

Teachers in various roles

each of them has a specific profile (educational, work, and psychological) and portfolio (task, temporal constraints, logistics)
### Users and Their Learning Styles

<table>
<thead>
<tr>
<th>Generic Profile and Portfolio</th>
</tr>
</thead>
<tbody>
<tr>
<td>andragogic self-organized learning</td>
</tr>
<tr>
<td>independent learner</td>
</tr>
<tr>
<td>self-regulated learning</td>
</tr>
<tr>
<td>self-motivated learning</td>
</tr>
<tr>
<td>reflective</td>
</tr>
<tr>
<td>arguably</td>
</tr>
<tr>
<td>analytical</td>
</tr>
<tr>
<td>situated in real world context</td>
</tr>
</tbody>
</table>
## Context Modeling

**Context in general: Enrichment by super-typing**

| Pragmatical context (situational, physical environment, social, policy, time) |
| Website context (provider, supporter, SW/HW stakeholder) |
| Explicit context (Story space) |

### Syntactic context
- **verbal context**
  - Media type suite, meta-information
  - Potential environment, information system, scenes, tasks, roles

### Extra-syntactic context
- **auxiliary correlates**
  - Actors, profile, payment, ...
  - Intention, theme, occasion, mission, purpose
  - Current scenario, history, current environment, user, goals, particular, culture
Systematic Storyboarding

**Scenario specification**

- **Scenario:**  ⟨name of the scenario⟩
- **Scenes:**  ⟨list of scene names⟩
- **Start Scene:**  ⟨scene name⟩
- **Final Scenes:**  ⟨list of scene names⟩
- **Actions:**  ⟨list of action names⟩
- **Transitions:**  ⟨list of transitions⟩
- **Process Expression:**  ⟨SiteLang process⟩

**General specification of scenes**

- **Scene:**  ⟨scene name⟩
- **Actions:**  ⟨list of action names⟩
- **Roles:**  ⟨list of role specifications⟩
- **User Types:**  ⟨list of user type names⟩
- **Defining Scenario:**  ⟨scenario name⟩
- **Acceptance Condition:**  ⟨condition⟩
Storyboarding Pattern

e.g. in data mining

- Business understanding
- Data understanding
- Deployment
- Data preparation
- Evaluation
- Modeling

Data mining learning cycle

Media types

WIS Engineering
Six Dimensions
Intention
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Story space: scenes, transitions between scenes, actors with portfolio and (general) profile
Many-Dimensional Didactics

The Didactic Scenario Quadruple

Content scenarios centered around content chunks or content suites

Control scenario based on assessment or control of the success of learning

Workspace scenario as auxiliary scenario for learning material, memos, with excerpts, solutions, collaboration

Collaboration scenario for groups, for communication, coordination, cooperation
Refinement for Web Information Systems

Example of a Scene: Login Scene to Learning Site

Login Scene With Adaptation of System Facilities to Learner

- Adaptation for interactive learning
- Change payment or profile
- Join supervised program
- Adapt for experiments with data
- Join cooperating group
- Module selection
- Program selection
- Unit selection
- Enter Login
- Learner login
- Anonymous login
- Extend by adding payment
- Join cooperating group
- Join supervised program
- Adapt for experiments with data
- Change payment or profile
- Adaptation for interactive learning
- Enter Login
Content through Open Learning Objects

Generation of Content Based on Learning Logistics

- based on general units
- extended with module and story space information, prerequisites, co-requisites, useful associated units
- extended by linking functions (in all varieties)
- imposed with refresh strategies
- adapted to the learner profile and portfolio
- filtered against the payment profile
- actualized on the basis of the learning history
Example of a Dialogue Scene: Supervised Solution of Exercises

- Three interleaved stories played in collaboration each with working space
- Three different actors collaborating space
- History tracking
- Collaboration space
- Special content, functionality and presentation for each actor

Supervised Solution of Exercises

**SUPERVISOR**
- Close group
- Develop new assignments
- Check answers
- Collect answers
- Define new assignments

**EXERCISE TEAM MEMBER**
- New assignments
- Answering sheet
- Discussion & evaluation
- Revised assignment
- Next assignment

**SOCRATES**
- New pending tricks
- Help hints & tricks
- Outdated hints & tricks

**MEDIA TYPES**
- WIS
- Story
- Actor

**WIS ENGINEERING**
- Six Dimensions
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Composing Learning Elements to Learning Units

<table>
<thead>
<tr>
<th>NameOfUnit $u$</th>
</tr>
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<tbody>
<tr>
<td>Identification</td>
</tr>
<tr>
<td>HeaderContent</td>
</tr>
<tr>
<td>Associations to Units ${u}$</td>
</tr>
<tr>
<td>Meta-data on Unit $u$</td>
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<td>...</td>
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</tbody>
</table>

Contained Elements

<table>
<thead>
<tr>
<th>NameOfElement $e_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
</tr>
<tr>
<td>Content of Element $e_1$</td>
</tr>
<tr>
<td>Associations to Elements ${e}$</td>
</tr>
<tr>
<td>Meta-data on Element $e_1$</td>
</tr>
<tr>
<td>...</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NameOfElement $e_k$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification</td>
</tr>
<tr>
<td>Content of Element $e_k$</td>
</tr>
<tr>
<td>Associations to Elements ${e}$</td>
</tr>
<tr>
<td>Meta-data on Element $e_k$</td>
</tr>
<tr>
<td>...</td>
</tr>
</tbody>
</table>
Example of Learning Unit Orchestration

Logistics, Adaptation and Sophisticated Playout

- Learning unit: \( e_1; ((e_{2,1}||e_{2,2}) \times e_{2,3}); e_3; (e_{5,1} || (e_{5,2}; e_{5,3})) \)

- plus prerequisites and useful knowledge: \( e_{16}; [e_{21}; e_1; ((e_{2,1}||e_{2,2}) \times e_{2,3})]; e_9; e_3; (e_{10}\|e_{11}); (e_{5,1} || (e_{5,2}; e_{5,3})) \)

- plus link associations, availability control and learner profile

  \( e_{16}; [e_{21}; e_1; ((e_{2,1}||_{SB} e_{2,2}||_{CB} e_{2,2}) \times e_{2,3})]; (\langle e_{17}; e_{18} \rangle; e_9; e_3; (e_{10}\|e_{11}); (e_{5,1} || (e_{5,2}; e_{5,3})) \)

- minus payment profile: \( e_{16}; [e_{21}; e_1; (\otimes_{SB} e_{2,2} \otimes \times e_{2,3})]; (\langle e_{17}; e_{18} \rangle; e_9; e_3; (e_{10}\|e_{11}); (e_{5,1} || (e_{5,2}; e_{5,3})) \)

- coping learning history - already finished elements and repetition: \( e_{1Repe}; [\langle e_{17}; e_{18} \rangle; e_{1Repe}; (e_9; e_3; (e_{10}\|e_{11}); (e_{5,1} || (e_{5,2}; e_{5,3})) \)

- coping with learning history - additional exercises and practical elements:

  \( e_{1Repe}; e_{25}; [\langle e_{17}; e_{18} \rangle; e_{9Repe}; (e_9; e_3; (e_{10}\|e_{11}); (e_{5,2}; e_{5,3}) \)

  \( e_1Repe; e_{25}; [\langle e_{17}; e_{18} \rangle; e_9Repe; (e_9; e_3; (e_{10}\|e_{11}); (e_{5,2}; e_{5,3}) \)

  \( e_1Repe; e_{25}; [\langle e_{17}; e_{18} \rangle; e_9Repe; (e_9; e_3; (e_{10}\|e_{11}); (e_{5,2}; e_{5,3}) \)
Generalized Data Warehouse Architecture

The Functionality for the Data Mining Tutoring System
Search Functionality

Intelligent Search and Navigation

Forms of search and navigation: well-formed query based on known databases structuring and infrastructure, search in known data massives, instantiated query and answer forms, menus with search terms, digging and hunting, dwelling based on associations, browsing jumping, zapping

Support for search and navigation: guidance, surveyance, hyperspace exploration with landscaping (Hänsel & Gretel), drilling into browsing, zapping, memorizers, update recharge, work place, work space

Support for formulation: formulation support, support for selection of available data, refinement and selection of content chunks, transformation of data, linguistical support (synonyms, troponyms, ...)
The Screenography Pentagon for WIS Presentation

Generic Generation of Layout and Playout

intention

context

The description of the kind or the specification of the general grid or pattern

content

functionality

storyboard

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Media types

WIS

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Actor
Concluding: 3\textsuperscript{rd} Generation Edutainment Systems

Learning support is far more complex

Research is sought on didactics
Research is sought on content integration and delivery
Research is sought on storyboarding
Research is sought on adaptation and context integration
Research is sought on success control

Open learning objects with context extensionality (story space, actor, user, payment, portfolio, association, history, ...)

Solutions are provided for didactics based on storyboarding
Solutions are provided for content adaptation and delivery
Solutions are provided for content development

Control functionality provided in the same fashion for exercises, tests, and exams for self-control or certification

Best-suited content just in time to the right place and device with the best pricing
Summarizing This Talk

Ingredients for story space modelling: intentions, users, profiles, portfolio, content chunks, (word field based) generic functionality, generators

Four-dimensional didactics: content didactics, control didactics, workspace didactics, collaboration didactics

Abstraction layers for story spaces: story style, (requirements) story pattern, (conceptual) story templates

Orchestration of story spaces: driven by intention, ruled by context, governed by content and functionality

Proliferation of advanced content: macro-data based on learning elements and units, concepts for drilling into knowledge, topics for sophisticated tracking and memorization, memes for memory priones and brain pattern

Edutainment is achievable for user communities, for interactive and cooperative learning