Didactic Design through Storyboarding: Standard Concepts for Standard Tools

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Abstract

The current state of affair in e-learning world-wide shows a reluctance to didactic design. Learners frequently complain and scientists discuss about insufficient adaptivity of e-learning offers to the learners' needs. Didactics is badly underestimated.

High quality didactic design is seen as a crucial aspect of dissemination. E-learning content and services need to reach their audience properly. Learners with different prerequisites, with different needs, with different expectations and under varying context conditions have to be addressed appropriately. Didactic design is seen as an issue of quality assurance in e-learning.

As well-known from quality management, high quality requirements and related measures towards quality assurance may turn out to be obstacles to dissemination, because quality may turn out to be expensive. The related answer are solutions frequently called quick and dirty. This does apply to e-learning as well.

The authors' own storyboard concept is introduced. Its reach goes far beyond the limits of current practices in e-learning systems and service development. The modeling concepts required are standard: annotated graphs. The software in use is standard as well: Visio. Emphasis is put on the investigation of how a suitable usage of the concepts allows for an expressive didactic design.

To sum up, the authors' intended contribution is twofold. First, they want to encourage didactic design through storyboarding in e-learning. Concepts are introduced and applications are demonstrated. Second, with the dissemination problem in mind, they want to show that concepts are crucial, but not tools. One can exploit advanced concepts toward sophisticated didactic design without an urgent need for costly software.

1 Didactics in e-Learning: Sketch of a Motivation

Designing and implementing e-learning systems does require a huge amount of knowledge from a variety of disciplines. Even under a very rough classification, at least the area of studies itself and information and communication technologies are easily identified as two major knowledge domains. Ambitious e-learning which aims at attractive services and cognitively adequate learner-machine interaction assumes a further type of background knowledge: *didactics.*

The state of affair in e-learning currently shows some obvious reluctance to didactic design. Learners complain and scientists discuss about insufficient adaptivity of e-learning offers to the learners' needs [17]. Didactics is badly underestimated.

How to encourage didactic design in e-learning? How to bring in didactic knowledge? How to make didactic variants subject to discussion and, more systematically, to quality assurance? How to establish a didactic design practice effordably, but not quick and dirty?

2 Dramaturgy and Storyboarding in E-Learning Practice

The current employment of dramaturgy and storyboarding in e-learning is characterized by misunderstandings. The so-called storyboard concepts in use [11] are mostly substitutes for software-technological documents of high-level design, but are not very much specific to the instructional design process [2, 15]. Didactic concepts [5, 7] are not made explicit and, thus, pondering about didactics is not sufficiently enforced. Even very recent approaches [16] remain within the borders of IT systems.

There are contrasting approaches [6] that are conceptually very useful, but syntactically much too far from a workflow directed to technology enhanced learning implementations.

The crux is that purely software-technologically driven concepts do not provide an opportunity to represent and discuss details of human learning [1, 3]. Learning is much more than memorizing: 'Learning imposes new patterns of organization on the brain, and this phenomenon has been confirmed by electro-physiological recordings of the activity of nerve cells.' [1], [p. 121] Learning is reasonably understood as an interactive knowledge construction process. Illustrative case studies are discussed in much detail in [4]. This book's chapter '3B Organizing Shapes' , for instance, nicely reports a lengthy process of conversation and co-operation between a teacher and his students in which a variety of media types, forms of interaction, and learners' activities are dovetailed.

Didactic design means the anticipation of those communication processes [5], and storyboards may provide the expressive power suitable to the design and implementation of learning processes. This, however, needs to go beyond the limits of software systems specification – the crucial question for innovations in didactic design.

3 The Potentials of Didactic Design

Frustration about the (sometimes disastrous) didactic quality of e-learning services in comparison to established educational practice [17] is not surprising at all. Imagine the enormous amount of individual experience and aspects of his/her own personality every teacher is bringing in (see [4]). In addition, recall the larger number of iterations of changes and refinements that carved out the profile of our teaching. Even in traditional learning environments the didactic design often appears as 'hidden knowledge' of human teachers.

Storyboarding for didactic design is aiming at a process in which pondering about didactics is made explicit and, through the externalization of decisions, may become subject to quality management.

Storyboards are not focusing on the specification of an e-learning IT system, but anticipating a variety of learning experiences for varying learners with varying goals under varying context conditions. The storyboard is foreseeing the learners' participation to arrange the learning process according to their own taste and needs.

Storyboards do not define learning paths, but create spaces in which learning actors potentially meet and act. Story spaces in [16] are somehow similar, but restricted to inside IT; ours are not.

Intentional dramaturgy may allow for emotionally appealing arrangements and for meta-cognitive impulses[1], e.g. *Engaging Minds* may be seen as the ultimate goal of our approach [4].

Minimal requirements to storyboards are:

- Storyboards deal with learning processes and, as such, deal with activities of learners. There is no a priori restriction to human-machine interaction.
- Storyboards make actors and locations explicit. Actors may be learners, co-learners, tutors, teachers, and possibly a variety of software agents. E-learning systems can rarely be seen monolithic. Locations are not necessarily online.
- Storyboards externalize and materialize didactic approaches to make them subject to quality management.

Meeting the requirements, storyboarding may turn from systems specification into didactic design.

[1] Brecht's 'V-effect' may be seen as a dramaturgical approach to meta-cognition; but Tarkowskij's perspective [18], e.g., is completely different. One may design, implement and apply 'Brechtian' vs. 'Tarkowskijan' storyboards.

4 Concepts of Storyboards and Storyboarding

The authors' storyboard concept is built upon standard concepts which enjoy an appealing visual appearance: graphs. Here is the core notion.

A storyboard is a graph with annotations to its nodes and edges. Nodes are scenes or episodes; the edges specify transitions between them. Scenes are elementary and may be implemented in different ways. Episodes are composite and are described by subgraphs. Key annotations to nodes specify actors and locations.

The concept may be refined by numerous additions as listed below. Note that all the following supplements are not really necessary. Many of them are implicit in the general concept. We discuss those detail only for the readers' convenience, to become a little more familiar with our ideas, aims and intuition. [In brackets we provide details about our current technological representation of storyboards in Visio^{TM} [9, 10]. Readers may use any other appropriate tool at hand.]

- Because those nodes that are called episodes may be expanded by subgraphs, storyboards are hierarchically structured graphs by their very nature.
  [Double clicking on an episode opens the corresponding subgraph on a separate sheet.]
- Comments to nodes and edges are intended to carry information about didactics. Goals are expressed and variants are sketched.
  [Clicking to a comment opens a window with the text incl. author information and date.]
- As far as it applies to a node, educational meta data (SCORM, LOM, ...) may be added.
  [Visio built-in object properties are used to represent general information and meta data.]
- Edges are colored to carry information about activation constraints and any variants of their adaptive availability. Certain colors may have some fixed meaning like usage for certain educational difficulties.
  [Clicking on edges opens didactic comments and meta data for adaptive behavior.]
- Actors and locations incl. those in the real world are assigned to elementary nodes, only.
  [Through programming, actor and location information may be propagated automatically.]
- Certain scenes represent documents of different media types like pictures, videos, PDFs ...
  [Double clicking on a scene opens the media object in a viewer, i.e. plays the film, e.g.]

As an illustration, we display an atomic scene from a storyboard (see below) recently designed. In a more detailed storyboard, this scene may be turned into an episode and, thus, be further refined subsequently. Therefore, storyboarding for e-learning is a processes that might never end. One may always take a scene, declare it an episode and continue in-depth design.

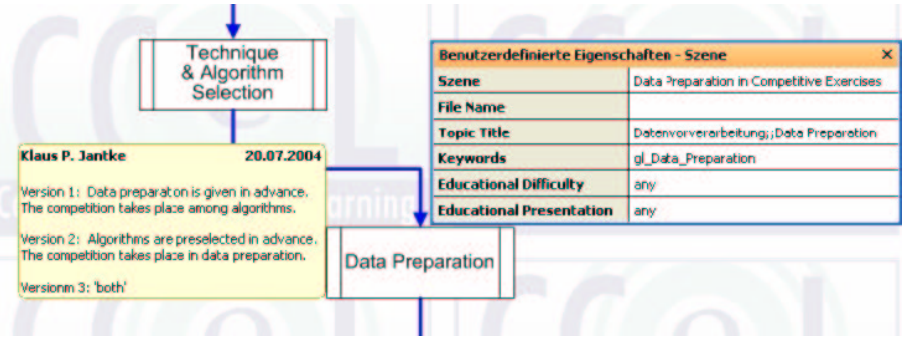

Figure 1: Annotations to an Atomic Scene from the Storyboard of Chapter 5

Clearly, the sophistication of storyboards can go very far. The concept allows for deeply nested structures involving different forms of learning, getting many actors involved and permitting a large variety of alternatives. Though this is possible, in principle, the emphasis of the present paper – driven by the goal of dissemination – is on simple storyboards designed *quickly, but not dirty.*

In our storyboarding practice, discussions begin frequently with a top level storyboard of only about half a dozen nodes. Discussing their arrangement is a first step toward didactic design.

5 Storyboarding Practice Exemplified

The authors have been working on a storyboard for studies in data mining to be implemented under remarkably varying conditions. The material is in use for a conventional lecture in Ilmenau, for another lecture in Saarbrücken and for an enterprises training program. The adaptivity to varying needs and contexts is deemed a key to e-learning dissemination.

The leftmost picture displayed in figure 2 shows the top level storyboard of a course design worked out at a meeting for storyboarding at Dagstuhl Castle on July 20, 2004. Then, the question how to embed so-called stories of success into the e-learning process has been left undecided. One easily recognizes an episode not connected to the storyboard graph.

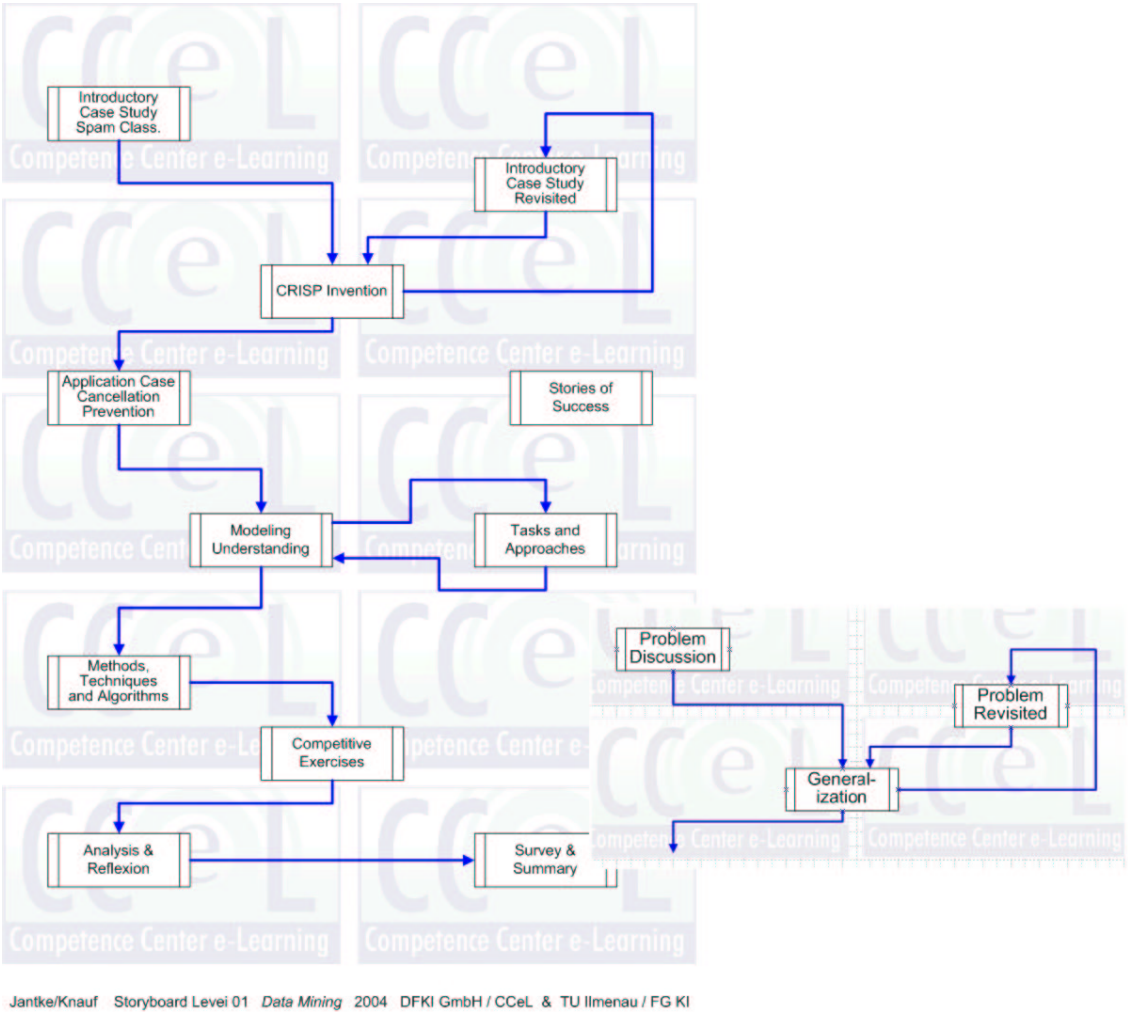

Figure 2: Didactic Design through Storyboarding on a Data Mining Course Top Level

The depicted storyboard has been designed for studies that are *problem-oriented* and *explorative*. The introductory episode, e.g., is implemented in rather different ways: (i) a classical lecture, (ii) individual studies with a web-based system, (iii) a discussion group off-line.

The first attempts of didactic design took place when the authors have been discussing the question what *problem orientation* should mean in their different e-learning lectures and courses. Implicitly, they did arrive at a template of three episodes depicted in the lower right part of figure 2. This template has been employed for the opening, e.g., of the data mining lectures and courses under consideration.

In such a way didactic ideas find an externalization, may be communicated and may become subject to reviewing and revision, if required. Quality management finds a firm basis.

Discussions about the pedagogical value and purpose of stories of success, in general, and those available to the authors about data mining, in particular, lead to two basic variants of how to invoke those stories of success displayed in figure 3. The color of the edges indicates that those

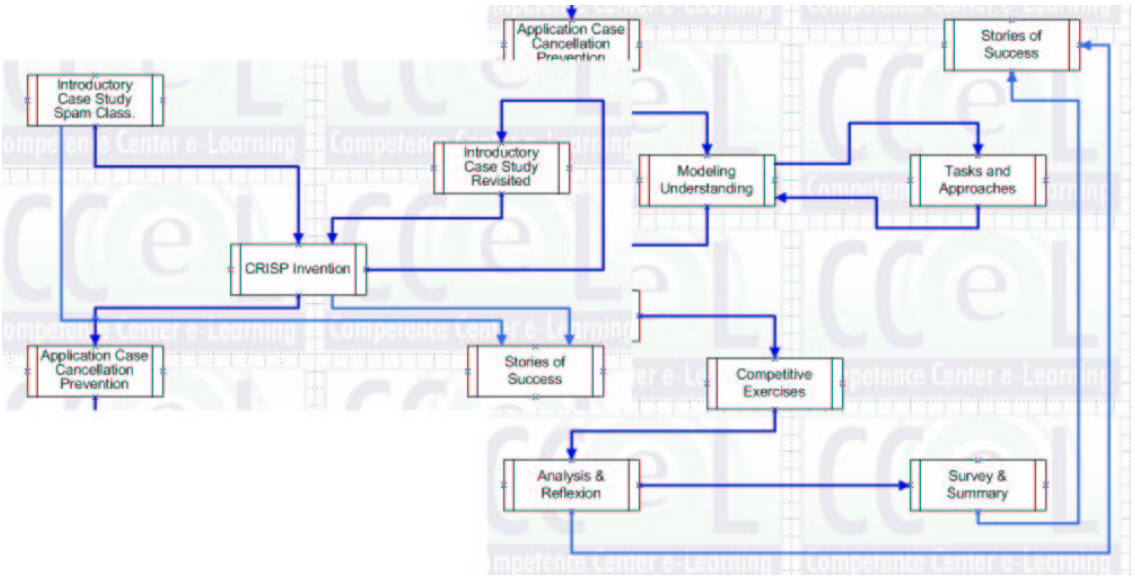

Figure 3: Two Cutouts of Didactically Driven Variants of Integrating Stories of Success

transitions are accessible by all learners, but are particularly offered to those who are classified as *illustration-oriented* (German term: beispielorientiert).

The authors' approach is learner-centered which means that potentially all available material[2] is accessible by every learner. But the guidance offered to the learner is didactically driven.

The refinement specification and implementation of a particular episode of the storyboard from figure 2 may be used for illustrating more details of the present approach. Let us take the episode entitled `Introductory Case Study Revisited` as a sample case.

For this episode, the current storyboard does contain three alternative refinements. On top, there is a subgraph specifying another storyboard level. The first scene is named `State of Affair Summary`. The second alternative is a sequence of lecture slides by the second author. There is no more need for further refinement. So, this is an atomic scene. Double clicking on the node opens the Powerpoint^{TM} presentation. The third point is a training-oriented atomic scene defining the implementation by means of a so-called open space. Some comment describes the required prerequisites and the didactic intentions. The actors are named. 'L' denotes the learner, 'C' stands for any co-learners, and 'T' means the teacher or trainer who is inevitable in an open space.

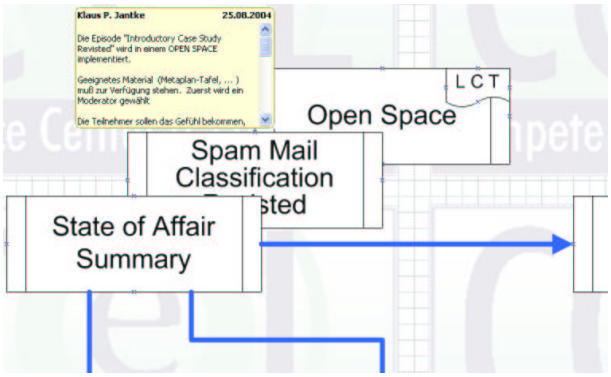

Figure 4: Alternative Implementations of an Episode

Storyboards of the type described are varying in depth and complexity. They allow for real-world locations and both human and IT agents. They can be multifariously extended on demand.

[2]There is one exception not to be discussed in detail within the present paper: Material which is subject to payment for non-registered users. In the underlying DaMiT system [8], an e-payment system is integrated which is triggered in dependence on user roles and registration details.

6 Conclusions

The authors of the present paper are very much convinced that their present approach is going beyond the limits of current storyboarding practiced in e-learning. Former approaches stay within the limits of IT (see [11, 12]) or are completely out of IT (see [6]). In [12], the authors narrowly focus on 'organization of course material'. In contrast, we are focusing the *organization of experience*.

With any standard software like Visio^{TM} from the MS Office family, storyboards are drawn as graphs anticipating learning adventures. Already small graphs can serve as tools going into deep discussions of didactics. Repeating graph structures do represent patterns of didactic design.

Storyboards may be implemented according to target users' desires and needs, to application contexts, to available resources, and to other criteria resulting in suitably varying mixtures of media and online resp. offline activities.

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