

Changes in the Production Process for E-Learning-Systems Using the Combination of Instructional and Narrative Models

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Abstract. Combining theoretical instruction and narrative concepts leads to a new quality of learning in e-learning systems. This has already occurred in the classical training and university teachings environments, but is a rare occurrence in current computer based training (CBT) programs. The research and development project, *medin*, utilises various methods of DS-CBT (digital storytelling based CBT) in its production process. The differences between classical hierarchical and new narrative methods are emphasised. Using different instructional and narrative concepts during the initial project planning phase creates a basis for an intense dialog between the author of the learning content, the computer scientists, media pedagogues, and media designers throughout the production process.

1 Introduction

Today's "multimedia" is often reduced to the combining of different media elements. Analogous to a structure of a book the content is presented chapter by chapter. Various elements such as images, animations, and videos are embedded in text of each chapter, whereas dramaturgical structures or narrative concepts are not utilised.

The BLK-project "Multimediales Fernstudium Medizinische Informatik" (predecessor of the project *medin*) created a complete series of courses for a medical computer science program. These courses can be taken at the University of Luebeck and as part of a distance-learning program at the Open University Hagen. The ongoing project *medin*'s goal is to convert the hierarchical learning structures of these courses into media-friendly and learner-friendly online learning modules. The gap between didactic concepts, narrative theories and media technology must be bridged. Digital storytelling concepts, instructional theories and corresponding multimedia elements are combined to create an innovative narrative learning structure. This is achieved by creating a dialog between the author of the learning content, the computer scientists, media pedagogues, and media designers.

2 The project *medin*

The project *medin* is sponsored within the framework of a German ministry of education and research program. The project is creating a series of multimedia learning units based on an existing series of courses for a medical computer science program.

2.1 Methodical columns and Project Partners

The project is based on following four methodical columns:

- the specific didactic processing of the contents (Institute For Medical Computer Science at the University of Luebeck)
- the realisation of didactical principles (Technical University of Ilmenau)
- the software usability principles (Institute For Multimedia and Interactive Systems at the University of Luebeck)
- the establishment of a virtual practice platform (Open University Hagen)

Additional project partners are the University for Applied Sciences Dortmund, and the Aachen University of Technology.

2.2 Goals

The project's goal is to integrate narrative methods in learning material in a multimedia and interactive environment. The main focus is implementing the following learning and teaching improvements:

- to have an easier access to the learning units and materials with the option to choose an individual learning path,
- virtual electronic labs as practice platforms where students can learn interactively and experimentally in situations that simulate real situations,
- 3D-illustration, simulations and animations, which make it possible to explain complex mechanisms contexts in connection with time, which otherwise, are very difficult to explain.
- The basis for this is to define the target groups which will use the later learning material. The target group at the Open University Hagen is a very heterogeneous group.

This calls for special attention when converting the learning content into multimedia learning unit. The programming of an XML-based product offers the flexibility to address each target group according to their learning needs. Under the heading "narrative elements in the project *medin*" we take a closer look at this aspect.

3 Building models

We will show that these concepts can be tied together in an effective and ingenious way in the form of two models: an instruction model and a narrative model.

3.1 Motivation as a task of the ARCS-Model

John M. Keller (Keller 1987) offers a very practical model of designing motivational instruction. This model is termed the ARCS model. The four components of the ARCS model acronym are Attention, Relevance, Confidence and Satisfaction.

The four main categories define the minimum instructional prerequisites. The motivational instruction process is introduced during the project conception and implemented during the whole designing process. Hereby follows the ARCS steps in detail:

- *Attention*: For catching students attention for the whole course, strategies include varying the pace or style of presentation of the course materials, using humour, and planning activities that require student participation.
- *Relevance*: Relevance is especially important in motivating students, since competing with their other priorities, such as part-time jobs, reduces the amount of time available to them for learning.

- *Confidence*: A useful strategy for confidence building is to plan for various “success opportunities” which motivates the students early on in the program. Other strategies are to set realistic goals for themselves, providing clear and specific criteria for evaluation, and attributing success to the student’s efforts when giving feedback.
- *Satisfaction*: Satisfaction is feeling good about accomplishing instructional goals. To increase the chance of students satisfaction, we should provide activities that allow new skills to be used in realistic settings. Transfer of learning information is intrinsically motivating.

3.2 Aristoteles’ model of the suspense in linear stories

Linear stories were already being told since the time of Aristotle. Aristotle divides the temporal turn of a storyline into four periods. In the *exposition* the characters and their environment are introduced as well as the problem, which is the basis for the further storyline. During the *ascending storyline* conflicts are intensified to increase the suspense of the story. These can arise either from ideological differences or from different levels of knowledge. The *climax* occurs at that point in time when a decisive step is done towards solving the problem. In the *dissolution* still open conflicts are solved. The audience reaches the level of suspense as it was at the beginning of the story.

3.3 The combination of narrative and instruction theory

Instruction and narrative theory can complement each other. Using narrative models has already occurred in classical training environments, but it is a rare occurrence in current computer based training (CBT) programs.

A comparison of the ARCS-model with the Aristotle’s’ classical suspense model clarifies that an ideal learning interface can only be reached if narrative methods are used early on in the production process of computer based training units. In both models there are four phases or sections, which are almost identical in their goals, which can be harmonized easily.

Similarly as the audience of a story, the students’ attention first has to be caught and maintained throughout the course, with the aim to introduce them to the problem field. The teaching goals have to be clarified, the students have to become familiar and acquainted with the possibilities offered by the learning environment. Game elements or alternating forms of presentation and interaction can support that. (Niegemann 2001) This motivates the students and therefore contributes to maintaining the students’ attention.

The “ascending” in the storyline is similar to the increase of the students’ familiarity with the teaching material. The increase of understanding of the material puts them into the position to be able to solve problems, which are becoming more and more difficult and complex.

With a high familiarisation of the learning environment and the teaching material the students reach the climax of the “learning story”. This is that moment, at which they for the first time are able to independently solve the given tasks and problems. Now they have done their first step to fulfil the requirements and evaluation criteria of the course.

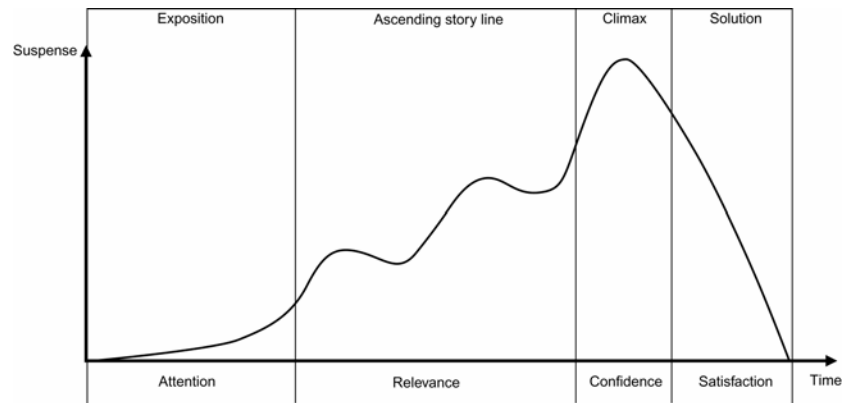


Fig. 1. The comparison of the ARCS-model with Aristoteles' model

In the dissolution, which follows the climax the students are offered the possibility of getting answers on still open questions. In addition, they can also try to use their acquired knowledge and try to adopt a routine with the learning material.

To increase the students motivation and encourage a greater degree of self-determination appealing redundant presentation techniques should be provided. The students' actions during the course and their answers to test questions must have a perceptible influence on the presentation and the content of the course material. Parts of subject material can be omitted or they can be presented in a target-group-oriented variation: implementing both different media elements as well as different points of view. This is achieved when the CBT-learning unit structure is not purely hierarchical, but non-linear and highly modular. The students navigate themselves through the learning material, independently and according to their needs but are guided by the system. Three aspects are of special importance. The students should not be left completely alone with the navigation in the subject material. They must be able to acquire the knowledge under the guidance of the CBT system. It must be established that the students learn all important content, despite of all the granted freedom of navigation. Exploring the material may not take place aimlessly. The students should not get "lost" in the material, for this decreases their motivation. The presentation has to be arranged in a way that the suspense is increased and the students' curiosity is held. They must be challenged by the subject material, but not overtaxed and if they become overtaxed, the CBT-system has to react. It has to lower the level of subject complexity, so that the students are following the training goal again.

4 Integration of narrative elements during the production process in computer based training

In opposition to hitherto CBT-systems, the above presented combination of the two models of instructional and narrative theory presents a challenge to radically change current production processes. The four different areas of competence have to cooperate in this creative process.

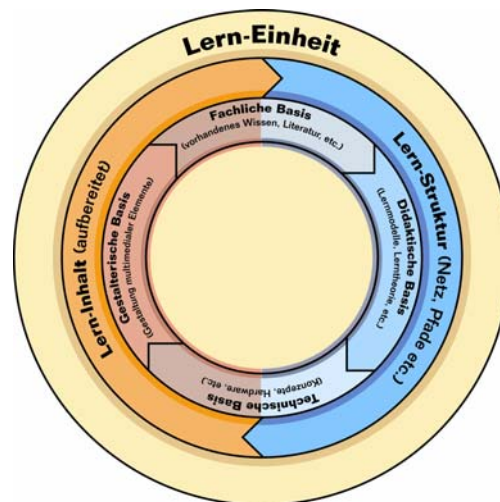


Fig. 2. Combined model of the production process for DS-CBT

- Specialist authors define the training aim. In arrangement with the technical authors media pedagogues select a learning model for the stuck training aim. With technicians and expert authors this learning model becomes adapted as far as necessary to the technical and expert conditions. Thus the learning structure becomes fixed. It describes, on which ways the teaching aim can be reached.
- Media designers prepare the teaching subjects for the multimedia use. It has to be guaranteed that the specific content is always reproduced in a correct way. While this is done via the consultation with the specialist authors, the media pedagogues check the prepared material on its media didactical suitability. Thereby Media producers supervise the possibility of the realization. In this way the prepared learning content is won. Now it is available in a multimedial and redundant form. Many parts are, if possible, regarded from different points of view.
- The prepared learning content then is embedded into the learning structure and results in the final learning unit. Achieves the student the end of this unit he has reached the training aim. The edited material can now be presented to the student. For this presentation however more expenditure is necessary than only a web browser or similar techniques. What has to be presented to the student and how this is presented to him in fact needs a more or less intelligent application logic, which selects the content and chooses a fitting presentation. For an application logic like this a CBT-system would be suitable, which includes methods of digital storytelling.
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- The so won media-library is the instructional contents and becomes embedded into the learning structure. This final learning unit is the learning goal for the students. According to the DS-CBT-model more expenditure is necessary than only a web-browser or similar techniques. The learning material, which is presented, needs an application logic, which is more or less intelligent. Building the suspense and keep it upright during the presentation is the task of this DS-CBT-system (Digital Storytelling-CBT).
- It selects, in which form the learning content is presented, chooses an appropriate instruction and narrative model and generates a story line whereby it considers:

- which instruction and narrative model is the basis for the story.
- which user model is actual, so that the correct target group can be addressed.
- which media elements exist for imparting expert knowledge.

Ideally, this interdisciplinary production process assures that the storytelling concepts and their corresponding multimedia elements are combined into an innovative narrative learning structure.

5 Narrative elements in the project *medin*

The experience of the *medin* project shows that it is important for the students to be able to choose between linear and non-linear learning paths. The linear path (guided tour) has the advantage that the students, especially for the target groups of the distance learning students, know they have worked through all the learning material.

After each chapter the students can test their knowledge with a self-test. A final exam will be written at the end of each the course unit.

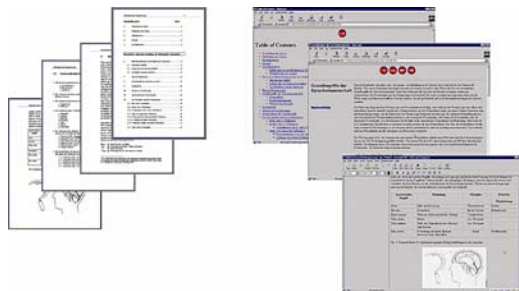


Fig. 3 Transformation of a hierarchical booktext from Word to HTML

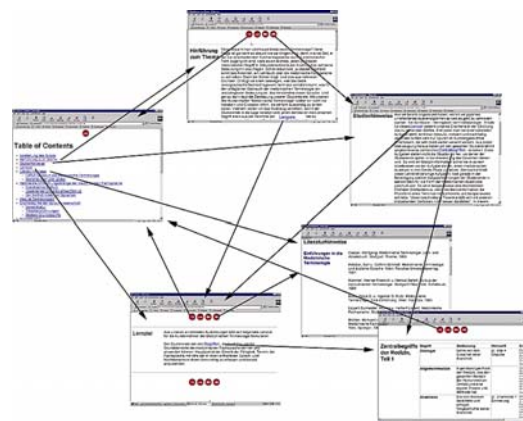


Fig. 4 Learning content in hypertext-form with the possibility of individual learning path

The students are additionally offered the choice of an individual learning path. This is made possible by creating an XML-based production process. By dividing the contents into several little semantic units makes it is possible to generate different user views. That means that students, while preparing for a test, can be shown different views e.g. all definitions or all chapter summaries. It is also possible for different target groups to have contents of different levels at their disposal. (Fig. 3 and 4 shows the difference between transforming hierarchical written textes into html-sites and the hypermedia-structured contents which allows an individual learning path.)

The visual generating of the learning contents is based on structuring the learning modules so that the conversion of the course material into multimedia elements gives the students the opportunity to be lead through the units according to their individual interests. In this case it must be guaranteed that students will be conducted back to the “guided tour” even if they use the interest navigation.

The experiences of the project *medin* make explicit that it is a major effort to convert and prepare author knowledge in a way that it can be used in a multimedia narrative supported CBT-System. The following problems were encountered:

- The authors of a CBT content mostly think in a classic hierarchical book-based structure. The necessity to break down these structures into a non-hierarchical form for the benefit of narrative concept and when inserting multimedia elements, often occurs. In projects of great complexity it is an absolute must because a restructuring the learning material at a later point in time is time-intensive and creates redundant work.

- Strategies must be found which support the authors in structuring and converting the learning material. The current authoring-tools offered to the author are very specialised.
- There does not exist currently any authoring-tool which would support interdisciplinary collaboration between authors, pedagogues, designer and multimedia producer.

The multimedia aspects can already be taken into account at an early time in the project planning. But the support deficit in the narrative area is tremendous. The development of narrative components in the e-learning is in the moment in its early stages.

6 Prospects

It would be recommendable to use the experiences of the *medin* project in a new production that corresponds to the visualised ideal. This would mean establishing CBT-modules with a strong narrative support platform. In this new project a software program (DS-CBT) would be devised which would implement narrative elements and technical specifications in developing meaningful structured learning units. So the narrative phases of suspensefull storylines are supported. In Each of phases learning material is presents so that the students are encouraged to become familiar with the course goals and material quickly, while maintaining their attention throughout the duration of the course. This would still require an intense collaboration between the author of the learning content, the computer scientists, media pedagogues, and media designers, but would insure that the end result would be a target-group-oriented product. Combining narrative and instruction theory with the learning content is the base to improving the motivation and learning performance of the students.

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