

HISTORICAL CONTEXT IN CONSTRUCTIVIST LEARNING ENVIRONMENTS

Christian Stary¹⁾

Position Paper

As the benefits of constructivism as a learning paradigm have become widely recognised developers of e-learning environments have started to implement principles of self-managed learning (cf. [2]). With the advent of didactic ontologies, e.g., [4], the didactical value of the conveyed content has moved to the centre of interest in development. The didactic value of content has to be considered as decisive factor for constructivist e-learning: “The material provided through online learning must have a high didactic value, since it is primarily intended for self-paced training.” [3] The context of a subject item and as such, the historical background of domain topics has become a didactic challenge for learner-centred knowledge transfer.

Constructivist approaches to e-learning provide environments to explore information and guide learners actively to build individual mental processes that occur during the construction of mental representations. Active (re-)construction is seen particularly beneficial for learners as they can pursue their individual interests, while they are motivated to communicate their understanding to others. As we know from studies in constructionism, the situated and public nature of any construction activity is identified as important (cf. [5]).

Computer technologies for learning have opened up new avenues for designing content, triggering active learner participation in transfer processes, and coupling communication to content. To meet the requirements for computer-mediated context-sensitive and collaborative learning, it must be possible for learners to explore different categories of information in virtual environments and to communicate, so that meaningful learning of a domain can proceed in tandem with establishing communities of practice. Still, the ultimate goal is to create personally meaningful mental representations (cf. [6]).

The significance of being able to treat learning as a socially valid exploratory activity, rather than a linear, planned activity, is recognised step-by-step. One appreciation can be gained through looking at deeper issues than domain-specific structures of knowledge, web-design of user interfaces, or domain-specific methods. It addresses context from different perspectives: (i) the didactic knowledge that drives the transfer of knowledge – developers have to look for a corresponding engineering process of content, (ii) communication channels utilised for learning and transfer processes – developers have to look for links of communication entries to content items, and (iii) information beyond focussed domain content, such as historical or cultural issues (e.g., ethno-computing in computer science education) – developers have to look for additional information relevant for holistic understanding of the domain at hand.

¹ University of Linz, Department of Business Information Systems-Communications Engineering, Freistädterstraße 315, A-4040 Linz, Austria, Christian.Stary@JKU.AT

In our research we have been looking at each of those issues. Our developments have not only been targeted towards didactically effective content development for web-based and mobile learning environments, but also towards context-rich, situation-sensitive knowledge transfer and learning (cf. scholion.ce.jku.at, www.mobilelearn.at). In the following an implementation of both aspects is sketched focussing on historical context of learning elements and transfer processes.



Figure 1. The SCHOLION frame of reference

The overall framework of the SCHOLION approach is shown in figure 1. It reflects the decomposition of learning material (termed information in the left upper corner) into so-called blocks. They are not only assigned didactic information types (see below), but also encoded into different media (text blocks, graphic elements, videos etc.) to enable multiple (re)presentations (polymorph content). Hyperlinking those media is traditional in e-learning (bottom left of the figure). In addition, in SCHOLION different levels of detail can be specified in a mutually tuned way, e.g., providing slides on the top level assigned to blocks on level 2 (representing a textbook). Annotations constitute individual views on content items by commenting, linking, or highlighting items, and enriching content blocks. One of those annotations can be links to communication entries of the SCHOLION communication components (chat, forum, infoboard etc.). In this way communication elements are directly linked to content blocks and *vice versa* (bottom right of the figure). Communication needs to be established among peers for learning, as well as between learners and coaches. The latter, as quality managers, are responsible for improving content and structures based on learner input and feedback.

In SCHOLION the content is arranged according to didactic information types. Currently, about 15 generic types of this sort have been defined and implemented. They comprise definition, motivation, background, directive, example, self test and other didactically relevant content

structures. Some domain specific block types, such as source code, profiles etc. have been added for various purposes including historical applications. Each block type can be visualised through a certain layout, e.g., coloured background. Block types allow learners to scan the entire learning content for specific didactic elements using a filter function. The workspace then shows only the selected block types. In this way learners might follow their interests and habits, such as starting to learn with studying historical background information.

In order to support self-management in this sense Intelligibility Catchers (ICs) are offered to learners. ICs are assignments made available through the bulletin board in SCHOLION. They have been designed to develop in-depth understanding of a topic based on empirical data gained from the European EISWeb project (cf. [1]). ICs should be structured as shown in the following table (1-7). The table also gives several examples to convey historical information along transfer and learning processes. The example stems from a learning unit on object-oriented modelling with the UML (Unified Modeling Language).

1 – Preface / Orientation	Modelling is a core activity in system and software development. So far the demand for modelling has been motivated. Now a specific modelling technique is introduced. The assignment helps exploring UML, a modelling language for system construction.
2 – Objectives	Understand UML 2.0 from a modelling perspective, including the UML rationale.
3 – Tasks	- Capture the development of UML 2.0 - Apply UML 2.0 for interactive distributed system design - Discuss your results with peers in the course-specific discussion forum
3.a Documented Work	<ul style="list-style-type: none"> • Filter content for ‘background information’ • Develop view², UML 0.x/1.x’ for each type of UML diagram • Search for historical background for each diagram, such as UML 1.0 versions • Supplement (annotate) each type of diagram with the information found • Annotate each diagram with a practical example in a separate view • Make views public • Describe your results in dedicated linked entries of the discussion forum • Compare and reflect results in topic-specific chats
3.b Intellectual Challenge	<ul style="list-style-type: none"> • (Re-)Construction of material • Develop individual position
4 – Conferences	Continuous feedback by peers and coaches
5 – References	http://www.omg.org
6 – Bulletins	Infoboard@Scholion.ce.jku.at
7 – Departmental Cuts	This assignment should take you no longer than 20 hours.

² A view is a virtual overhead slide put on top of content items containing all annotations. It can be made public to share annotations with other users, or remain private for further learning.

The orientation section addresses the stage the IC should be used and what learners can expect when accomplishing the IC tasks. The objectives set the scope in terms of the topics that are addressed and the understanding that should result from exploring and processing topic information. It reflects the didactic value of that learning unit. The task section comprises a documented and an intellectual work part. It encourages active information search and processing, communication, and personality development. The conference section sets the rules for the community of practice. The reference section provides links to material that helps to accomplish the tasks. The bulletins can be dynamically created and are available in the infoboard. Finally, the departmental cuts reveal the estimated individual effort to meet the objectives.

The structure combines organisational with subject-specific information arranged from a didactic perspective. For instance, the orientation section in the beginning informs coaches and learners when to use this IC addressing competencies, the content involved and the role of learners - in this case self-managed exploration and collaboration. The learners are encouraged first to identify those blocks of the learning unit where historical information is already available, i.e. part of the prepared content. Then they are asked to complement particular content items, namely UML diagrams, that have no historical background so far. After practising, all results should be shared with peers, enabled by views and focussed, content-related discussion items. All results are validated by the coach through feedback, in order to ensure correct learner representations.

In summary, historical context can be provided in self-managed collaborative e-learning environments, such as SCHOLION, in a variety of ways:

- *Defining or using didactic block types*, such as background information: In this case historical information is part of the prepared content, and can be filtered by learners.
- *Searching for historical items*: In this case historical information has to be searched, since it is not part of the prepared content. The search results can either be linked to content blocks through hyperlinks, or attached to forum entries.
- *Creating history view*: Hereby, historical information is captured in text annotations, forum entries linked to content items, or content-specific hyperlinks as part of a dedicated view.

In each case information can be shared immediately after (historical) information becomes available, either through filtering, exchanging views, or attaching it to an entry of a public forum that is directly linked to a content item.

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