

Scenario Based Methodology for User Testing in Learning Environment

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Abstract: POGO¹ is one of the ESE projects and addresses story building as a key concept to drive technology development. The design process is based on a parallel and iterative process where user observations are concurrently combined with an open concept and content generation and flexible technological implementation. We propose a scenario-based methodology for User Testing of the Pogo Learning Environment in order to facilitate the operative co-operation and integration of the different competencies along the design and evaluation process. The main innovative feature of the proposed approach is the distinction between “micro” and “macro” scenarios. Micro scenarios aim mainly to detail interaction aspects and to provide a context for user testing. Macro scenarios will be used to evaluate the final integrated system (the Pogo world). This two-step method allow to ground the user evaluation into the current narrative practices and to build-up progressively a significant test-bed for the envisioned narrative activities that Pogo World aims to enable.

POGO BACKGROUND

POGO, one of the ESE projects (<http://www.i3net.org/schools>) addresses story building as a key concept to drive technology development: a virtual and real environment where children create, explore and develop language and social skills. POGO aims to support children in the creation of stories. Its design process involves participants such as psychologists, designers, technologists and users (children, teachers and educational experts). It is based on a parallel and iterative process where activities of user observations are concurrently combined with an open concept and content generation and flexible technological implementation. This parallel and iterative process on the one hand, allows good communication and co-operation among all the roles involved in the project, and on the other hand, grounds the concept development in the current narrative practices. The design process is based on three concurrent and interactive issues: a) the definition of pedagogical objectives, b) the study of narrative activities at school, c) the development of design concepts.

1.1 The definition of pedagogical objectives

POGO aims at orienting the development of an environment which mediates new modalities of narration exploiting the theoretical framework of Cultural Psychology, and in particular, the work of two of its leading figures: Vygotsky and Bruner. The contribution of these authors

¹ The POGO consortium includes Philips International (co-ordinator), Università di Siena, Ravensburger AG, Université de Liège, Domus Academy, Cryo-Interactive.

has allowed defining five pedagogical objectives that drive the all POGO design process. The pedagogical objectives can be summarised as follow; Pogo environment should:

- *expand as much as possible children' sensorial experience;*
- *support children in developing emotional knowledge (e.g. empathy);*
- *allow them to embody and concretise the product of their imagination;*
- *support the child in building his fantasy and world model through discussion and co-operation (intersubjectivity)*
- *support co-operative mechanisms and reflection (metacognition).*

1.2 The study of narrative activities at school

In parallel with the definition of POGO's pedagogical objectives, a long period of time has been dedicated to observation. Our goal was to understand when, how and for what purpose narratives are used at school. From the pool of observed activities we selected together with the teachers, the most successful ones; i.e. the ones that allow the best achievements of pedagogical aims and at the same time that allow the best engagements for kids.

Next, this subset of narrative activities has been represented in Narrative Activity Models (NAM's). In order to generate models that are representative of the complexity and richness of the observed activities, we described them with significant features both from a theoretical viewpoint (tools, physical space, social relations, pedagogical objectives...) and from teacher's viewpoint (chronological sequence, macro-clustering of some basic tasks, pedagogical aims...). These models were iteratively developed with the teachers and licensed after their approval (fig.1).

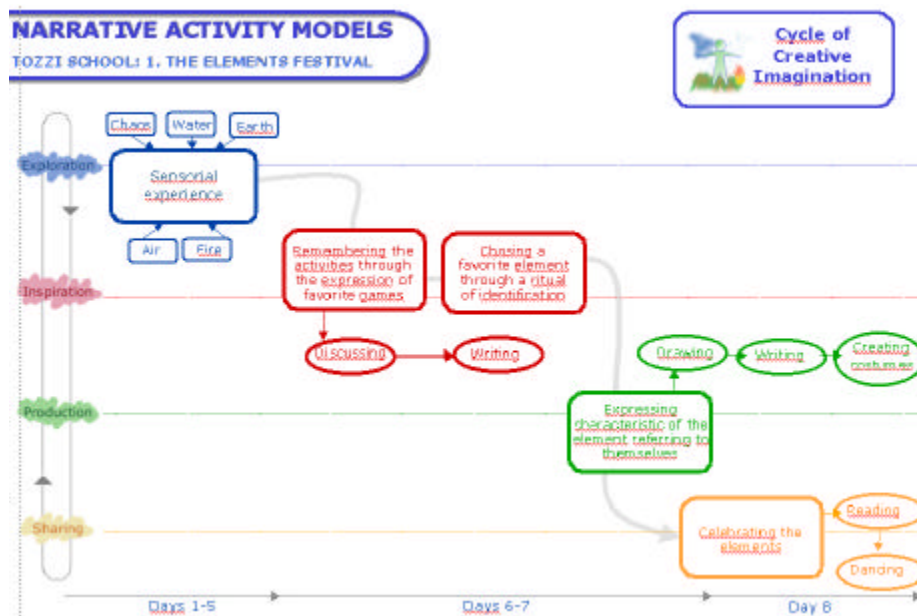


Figure 1: one of the NAMs

The NAMs were used to define the users' requirements and to relate them to the Pogo concept and enabling technologies. In particular the requirements emerged mostly by trying to answer the following question: what are the components of the activities performed in the classroom that make them effective and successful in achieving the pedagogical objectives?

1.3 The development of design concepts.

In parallel to the definition of pedagogical objectives and to the user study an open concepts generation phase was initiated. Design concepts have been developed in order to envision the different ways in which children, supported by enabling technologies, can create new narratives. The different participants of the project (researchers, users, designers and technologists) were asked to elaborate on the proposed design concepts. At the end of a continuous set of sessions we could single out three main phases: a) "what if" concepts, b) tools concepts, c) activity concepts. The activity concepts are the one more properly matching with pedagogical objectives and narrative practices, furthermore they envision new powerful opportunities for the role of narratives in pedagogical practices. The basic idea is that narrative practices at school are more than just storytelling and story creation in the mind, they are articulated social practices that makes the child the fundamental actor in close relationship with peers and, first of all, the teacher(s) (Vygotsky, 1972). These practices span from the sensorial experience, at the base of each narrative activity, to the expression of kids' product, going through a rich phase of inspiration and creation. The POGO world aim at supporting all these phases but also at allowing an evolving loop of narrative activities through the concepts of story setting and situated editing. The POGOWorld (Fig. 2-3) can be accessed and experienced from two main settings that correspond to different modalities to interact with the POGOWorld: the school and the home. At school POGO allows to collect, analyse and edit either single elements (like drawing, photos, writing, movies, etc.) or cluster of elements in a spatio/temporal order. At school children using the POGOTools, like the POGOTorch, the POGOSettings and the POGObeamer, interact with virtual elements distributed on a rich sensorial physical environment. At home POGO allows to analyse and edit single elements along a virtual story-line that is one of the possible ways of representing a story structure in the virtual domain. Story elements created by children in one of the two environments are reflected and displayed in the other one, stimulating the co-operation in the story creation activity. These actions are performed through POGOTools, which are tools for interacting with the StoryWorld by collecting/producing media and by editing in a situated modality media in a story structure. In this framework situated editing means, using a filmmaking analogy, like if the tools for inspiration, scripting, shooting, editing and montage were continuously available to the creative imagination of kids and teachers.

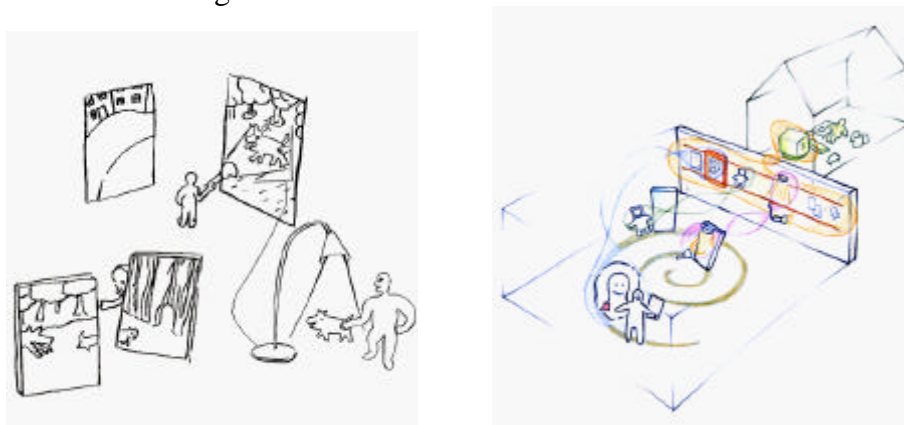


Figure 2 and 3: PogoTools and Activity Concept

Once that Narrative Activity Model and the concepts design have been developed in parallel, it has emerged the need to evaluate these concepts by integrating both contributions. We adopted thus a scenario based methodology, inspired by the model proposed by Houde and Hill (1998).

SCENARIOS FOR PROTOTYPING AND EVALUATING

In the Pogo project, we mainly used scenarios for user requirement specifications, for prototyping Pogo tools and for user evaluation. In the following we mainly explain the use of scenarios for prototyping and evaluating the Pogo tools. Scenario building, thus, is the methodology we adopt to envision the use of the Pogo world for educational activities and to evaluate the impact it can have with respect to the pedagogical objectives. This methodology involves the creation of realistic scenarios, mainly based on the observed activities at school, in order to evaluate how the Pogo world can support these activities and how it can stimulate new and unpredicted uses (Carroll, 1995). Scenarios grounded on the current practices at the school allow to harmonise the proposed design concepts with the educational curricula and cultural habits and make them more easily evaluated in the school environment.

Prototypes are usually the key concepts to implement such processes where design and evaluation are the two sides of the same coin. However, when speaking about prototypes people have in mind different concepts. Houde and Hill (1998) explain that the concept of prototype is likely to be ambiguous on interdisciplinary teams, in particular those involving computer scientists, engineers, interaction designers, human factor experts. Each of them has a different expectation of what a prototype is. For example, usually industrial designers call a moulded foam model a prototype. Interaction designers refer to a simulation of on-screen appearance and behaviour as a prototype. Programmers call a test program a prototype. A user studies expert may call a prototype also a simple storyboard.

What is significant to characterise a prototype is not what media or tools were used to create them but how the designer uses them to explore or demonstrate some aspects of the future artefact uses. Therefore a prototype can be considered as any representation of a design idea, regardless the medium.

In the following, we describe the scenario-based methodology we adopt to define scenarios for prototyping and evaluation. This methodology is inspired by the prototyping approach proposed by Houde and Hill, and it is articulated in two main steps:

- definition of micro scenarios as a means to evaluate detailed aspects of the use of each Pogo tool (including the specific *look and feel*);
- definition of macro scenarios as the overall context in which more complex and articulated activities can take place.

Developing prototypes

As explained above we adopt the idea to consider a prototype “as any representation of design idea regardless the medium”. Houde and Hill provide a model of what a prototype prototypes to clarify, which aspects of the final artefact different prototypes can demonstrate, and how different prototypes can evolve in the final system.

The model addresses the following fundamental questions about the interactive system being designed:

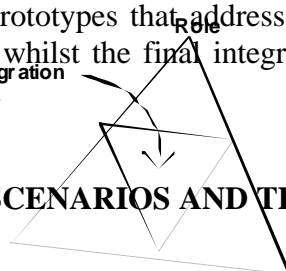
- 1) What role will the artefact play in a user’s life?
- 2) How should it look and feel?
- 3) How should it be implemented?

The dimensions of the model are defined as *Role*, *Look and feel*, and *Implementation*.

Each dimension corresponds to a class of questions that are salient to the design of any interactive system. “Role” refers to questions about the function that an artefact serves in the users’ life, the way in which it is useful to them. “Look and feel” denotes questions about the concrete sensory experience of using an artefact, what the user looks at, feels and hears while

using it. “Implementation” refers to questions about the techniques and components through which an artefact performs its function. The goal of the model (fig.4) is to support the designer in separating design issues into three classes of questions that frequently demand different approaches to prototyping. Implementation usually requires a working system to be built; look and feel requires the concrete user experience to be simulated or actually created; role requires the context of the artefact’s use to be established. The model helps visualise the focus of exploration. However in POGO the early prototypes were never located at the vertex of the triangle since each components been driven by the constrains and facilities provided by other components. The development process adopted in Pogo mainly addresses the three components of the triangle model with the aim of arriving at the development of an integrated system (the Pogo world).

The evaluation methodology that is proposed is defined to test these different types of prototypes. In particular, early prototypes that address one of the three components will be evaluated using micro scenarios whilst the final integrated system (the Pogo world) will be evaluated using a macro scenario.



3. CREATING THE MICRO SCENARIOS AND THE MACRO SCENARIO

As set of micro scenarios have been designed to detail interaction aspects and to provide a context for user testing. In this respect they are mainly scenarios for:

- envisioning specific situations in which the Pogo tools are used and the way in which they are supposed to be used, (Houde & Hill, 1998).
- evaluating interaction mechanisms and all the detailed aspects related to the three components of “Role”, “Look and feel” and “Implementation”.
- evaluating the added value of functions in terms of pedagogical objectives

As stated above, micro scenarios are strictly linked to the observed activities in the schools. In accordance with the teachers we support a narrative activity performed in the school by simulating one or more functionalities that could be possible by using the POGOtools. The process of creation of the micro scenarios starts from very simple account of activities, with a unique and simple rational (objective), to more complex sequence of activities where the achievement of the final objectives requires collaboration between actors, negotiations, co-ordination. With respect to the Pogo project development process the micro scenarios provide input to:

- Content developer to define characters and narrative elements,
- User Researchers to define test-bed to evaluate the POGO tools.
- Conceptual designer to refine concept activities and interaction modalities.

On the other hand, Macro scenarios will be used to evaluate the final integrated system (the Pogo world). As a general strategy, we decided to select one macro scenario that will be used to evaluate the Pogo world in both the schools, and two macro scenarios based on different activities performed in the two schools, that are representative of the different pedagogical approaches. In this respect they are mainly scenarios for:

- evaluating the added value of the POGO concepts with respect to the global narrative activities and creation process
- guiding the iterative process of refinement of contents definition, interaction modalities and implementation

Concerning the first point, the common macro scenario has been built on the envisioning of an evolving narrative activity model. Indeed, from the NAMs, two different uses of narration

emerged. Narratives can be used as instrument of expression producing different kinds of narrative (drawing, text, dances, etc.) or as objects of analysis of stories. The envisioned model foresees the combination of both activity cycles in one evolving narrative activity model (ENAM). This evolving narrative activity model (ENAM) represents a summary of all the components of narrative activity observed at school and can be used as scenario to evaluate the added value of the envisioned Pogo World.

The different applications of micro and macro scenario become clearer at the light of their representations (fig5). Indeed, the micro scenario can be described only by one cycle of narrative activities while the macro scenario is build on the evolution of a first cycle into a more complex one.

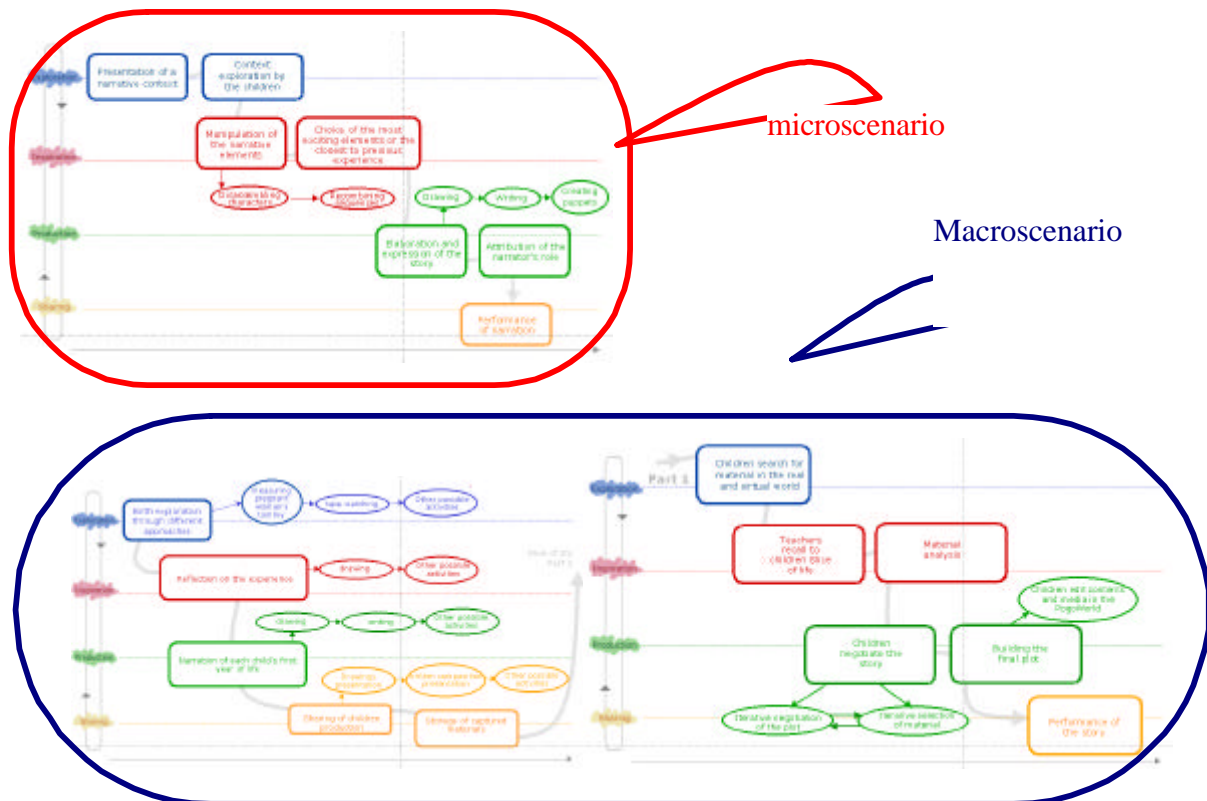


Figure 5

We began a first evaluation phases based on micro-scenarios. Our very preliminary results confirmed us the soundness of the proposed approach. On one hand, in facts, we are detailing by these findings user requirements both with regards to functional and interaction aspects. On the other we are progressively refining and validating the ENAM model, verifying at each step that the envisioned activities are really grounded in the current narrative practices.

CONCLUSIONS

This work proposes a scenario-based methodology for the evaluation of a Learning Environment (Pogo World), designed to detail interaction aspects and to provide a context for user testing. This method aims to facilitate the operative co-operation and integration of the different competencies along the design and evaluation process, and to merge user-centred design with conceptual design. The way in which scenarios are generated allow either to evaluate interaction mechanisms and all the detailed aspects related to the three components of

“Role”, “Look and feel” and “Implementation” or to evaluate the final integrated system (the Pogo world) within the envisioned evolving narrative model.

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