Proceedings of 1st Workshop on Narrative and Learning Environments

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Summary

This deliverable contains the proceedings of the First Workshop on Narrative Learning Environments.
This two-day workshop, organized for the partners of the network by the SIG "Narrative and Learning Environments", aimed to bring together scholars and scientists from different disciplines, to discuss, deepen and develop research and applications in the relatively new area of Narrative Learning Environments (NLEs).
The workshop featured, in the first day, an invited talk by Ruth Aylett of Heriot-Watt University (UK), and several presentations by the participants.
The second day was completely devoted to discuss theoretical and practical issues emerged during the paper presentations.
This workshop is expected to be the starting event of a series of activities promoting the development of research on narrative learning environments.
We hope that this work could help people involved in education become aware of the possible impact of narrative on learning and of the variety of applications that can be used in this respect.

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Proceedings of the 1st Kaleidoscope Workshop on Narrative Learning Environments

Lisboa, Portugal, 9-10th June 2005

Foreword

This two-day workshop, organized for the partners of the network by the Special Interest Group "Narrative and Learning Environments" (SIG NLE) of Kaleidoscope, aimed to bring together scholars and scientists from different disciplines, to discuss, deepen and develop research and applications in the relatively new area of Narrative Learning Environments (NLEs). This expression usually indicates those learning environments, mainly ICT-based, which make use of narrative for educational purposes. The workshop focused on the different ways of conceiving and using narratives, as concerns both creating them and fully exploiting their educational potential.

The workshop featured, in the first day, an invited talk by Ruth Aylett of Heriot-Watt University (UK), entitled: "And they all lived happily ever after? Stories and learning" (which is not included in these proceedings) and several presentations by the participants. The second day was completely devoted to discuss theoretical and practical issues emerged during the paper presentation.

The contributions presented by the participants well reflect the variety of possible uses of narrative in education., where this term is always related to Bruner's definition[1]: "*(narrative is) a unique sequence of events, mental states, happenings involving human beings as characters or actors.*"

Due to the amount of different elements that contribute to shape a Narrative Learning Environment, several different classifications of the participants' contributions are possible.

As concerns the age of the prospective users, most papers refer to NLE for primary school children, with the exception of (7)[2] and partially (9); the work presented in papers (1), (3), (5), (9), however, could in principle be extended also to adult or young adult users.

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1 Bruner J (1990) Acts of meaning. Harvard University Press

2 The numbers in parentheses refer to the papers' numbering in the table of contents.

A unifying feature of all the presented applications is the playful character, though only few of them (6), (7), (8) can, strictly speaking, be defined as narrative *games* with an educational content.

Speaking of narrative games, it appears important to distinguish if their narrative has actually a cognitive influence on the learning process or if it is used to "sugar the pill", that is, to provide a pleasant context apt to support student's attention. This function should not be considered negatively, since raising user's interest supports motivation, and this is fundamental to make any learning possible. Closer to this case are the contributions (6), (8), (9).

As concerns the student's position with respect to narratives, besides the mentioned basic distinction between producing a narrative or being given one, it is possible to make a finer distinction based on the role that the user actually plays: story author (1), (3), (8), story teller (1), (2), (4), (8), story participant (1), (5), (6), (7) and audience (3), (5), (9). The numbers which are repeated in this subdivision refer to possible different uses of the mentioned environments.

As concerns the application domain, some of the considered environments aim to make students learn how to construct a story or to acquire expressive abilities (2), (4), others are focused on some particular topic (1: language learning), (5, 7: social competence), others are environments that could be adapted to convey different contents (3), (6), (8), (9).

Finally, as concerns the technology used, all contributions refer to *ad hoc* narrative tools, except (3), which builds a leaning environment by using a general-purpose tool (e-mail).

This workshop is expected to be the starting event of a series of activities promoting the development of research on narrative learning environments.

We hope that this work could help people involved in education become aware of the possible impact of narrative on learning and of the variety of applications that can be used in this respect.

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Part 1

Participants' contributions

Multimedia Software for Narrative Creation in the Learning of a Foreign Language

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Abstract. In this paper we analyze a selection of narrative-oriented software tools which can benefit young people's foreign language learning by fostering creativity, encouraging the use of target language and helping to develop communication skills, all within a motivating context. Using these programs students can create various types of narrative, including "talking" storyboards, interactive stories, animated cartoons, virtual dramatizations, etc. Finally we examine the learning potential that can be realized within multimedia narrative production, comparing this with more traditional narrative activities carried out in the classroom.

1 Introduction

Narrative has long played a key role in the learning of a foreign language and has spanned across a wide variety of teaching approaches and methodologies in this discipline [11]. As source material for study, narratives have been presented in a variety of representational codes and media (written, spoken, pictorial, multimedia and, more recently, hypermedia) and in forms that address various age groups, ranging from story-telling for very young students, through to graded readers in lower-secondary schools and on to the study of target language literature at upper secondary and university levels.

In communicative approaches to foreign language teaching, which have followed in the wake of the work of linguists such as Hymes [6] and Halliday [5], narrative plays a central role not only as source material but also in the development of communication skills through the creation and performance of situated dialogues and dramatizations in which key vocabulary and/or notional and functional structures are to be employed; attention is strongly focused on meaning and only subsequently shifts to form [14]. Students often work in small groups or pairs to transfer information and possibly negotiate meaning in simulations, role-plays and information gap activities: the teacher's role is primarily to facilitate communication, observe, and only at the conclusion to correct errors. The aim in all these activities is that students will successfully acquire target language, consolidate their knowledge and hone communicative skills in the process [12].

The tenets of the communicative approach have also been reflected in the field of Computer Assisted Language Learning (CALL), leading to what Warschauer and

Healey [13] define as communicative CALL, which puts the focus more on meaning than on form and encourages students to produce original utterances rather than just manipulate prefabricated language.

The recent shift from a cognitive view of communicative teaching to a more socio-cognitive view has led to greater integration of the various skills (e.g., listening, speaking, reading, and writing) in CALL and a much more central role for technology in language learning; this trend is defined by Warschauer and Healey [13] as integrative CALL. In the words of Debski [2] "today's CALL is about how language learners can establish optimal relationships between themselves and learning resources via computer-supported media in order to pursue real communicative tasks". One of the key features that Debski emphasizes in this paradigm shift is that creativity "provides primary impetus to student activity (and) is to be fostered at all times [...] and across all levels of language learning".

An excellent means for bringing creativity to the learning of a foreign language is through the creation and sharing of multimedia narratives, which provide a strong stimulus and meaningful context for target language use. Picture based narratives have a particularly significant role to play in the foreign language learning of young children, not only because images are an important aid to comprehension and learning, but also because of children's familiarity with stoytelling as part of their first language learning: in other words, narrative is a form they are accustomed to and feel comfortable with - familiar ground in the often strange surroundings of a foreign language. In this paper we analyze narrative-oriented software which can benefit language learning by fostering young people's creativity, encouraging the use of target language and helping to develop communication skills within a motivating context.

2 Narrative-based authoring software

Most people's idea of learning a language with software is of interacting, to a greater or lesser degree, with pre-packaged material that has been created and structured by program authors so as to meet specific language learning needs: only in limited cases is it possible for the user to modify this material or even create new content. The most well known example of these "closed" programs is of multimedia language courses on CD-ROM**,** designed mostly for individual learning. Such programs can be very effective where they allow the student to interact with multimedia-rich material and follow personalized learning paths [3].

Another type of software exists, which we can define as "open", in that it is dedicated largely or wholly to the creation of multimedia material on the part of the user, be it student or teacher, possibly working individually but more likely (and more fruitfully) operating on a collaborative basis. These programs, which belong to the broad category of software known as multimedia (or production) tools, can prove extremely effective in foreign languages as a means for stimulating students to use, and interact with, the target language. Among the different kinds of products that students can create with these programs are narratives, which may take various forms: "talking" storyboards, interactive stories, animated cartoons (both 2 and 3

dimensional), virtual dramatizations, etc. Software can provide an extremely useful support for the various phases of the narrative process:

- planning a story outline;
- constructing the locations and settings in which the story is to unfold;
- choosing/constructing characters and props;
- directing the action and character interactions;
- scripting/producing dialogue, in some cases through vocal recordings and/or text-to-speech generation;
- integrating sound effects and/or music to enhance the sense of realism and produce a particular atmosphere.

Which of these phases will actually be undertaken, how they will be handled, and the relative importance they will be attributed, depends very much on the teacher's language learning goals, the type of learners involved (age, level of ability) and the learning context, including the software environment adopted. In the following we examine some examples of software that are useful for performing these activities in the context of the language learning classroom. The programs examined are targeted primarily at a young user group. However, with the exception of one product aimed specifically at primary school children, there is no reason why they might not also be used with adults as well.

3 Software Examples

The programs described below were selected from among the 3,500 titles present in the Educational Software Library[3] of the Institute for Educational Technology (ITD), part of the Italian National Research Council (CNR). We identified 74 (mostly English language) programs destined for use by young learners which offer them authoring capabilities for the creation of multimedia artifacts of various kind. From these we made a selection of programs designed to foster students' creativity through the development of different types of narrative. Even if not all of these programs specifically address the learning of a *foreign* language, they do offer the significant advantages in terms of motivation and contextualisation for target language interaction, as well as featuring learning material (e.g. captioned images, ready-to-use lines of dialogue) and/or tools (text-to-speech, closed captioning) that can be extremely useful for language learning purposes.

The first program, **Story Maker 2**[4] (Fig. 1) is a good example of software designed to let primary school students create multimedia stories as part of their (foreign) language learning, with content (backdrops, characters, and props) that reflects both the English-speaking and French-speaking contexts. In their work young authors can easily embed elements, animations and hypermedia links to be activated when the

[3] The library (Biblioteca del Software Didattico) is the largest of its kind in Italy. The library catalogue, along with other resources (in Italian), is available through the related on-line service Essediquadro [http://www.sd2.itd.cnr.it/]. The library and Essediquadro are funded by Italy's Ministry of Education.

[4] Published by SPA Software, 2003 - http://www.spasoft.co.uk/

authors themselves or classmates, peers, parents, etc. interact with the final narrative. Even young children can use this program to build an interactive narrative in linear fashion, as a sequence of "pages" or scenes, or, alternatively, as a work to be explored in hypermedia fashion. The basic components of each scene (backdrop, characters, props, details, sound effects, etc.) can be selected from the program's repertoire of elements and inserted in simple drag-and-drop mode: authors can also insert their own images or sounds to personalise the production further. Figures and objects in the scene can be animated simply by dragging them in the desired fashion around the screen: a range of fine-tuning options is available. Dialogue can be recorded or reproduced using the program's customizable text-to-speech system (which "pronounces" written language via automatic voice synthesis), available in a number of different European languages, including a special version of English designed for foreign language learning. In either case, vocal tracks can be associated to cartoon-like speech/thought balloons encapsulating written text or images. The possibility to insert invisible hyperlinks means that the narrative developer/s can determine in what way the various animations, sounds and voices will be triggered when the end user interacts with the scene. Such links can also be used as a bridge from one scene to another. While interacting with the story in PLAY mode, the learner can choose to activate text and sound tags identifying the various elements in the story (objects, animals, characters, etc.), a feature that is particularly appealing for developing and reinforcing children's grasp of English vocabulary.

Indeed exploring and practising the names of different items introduced into individual scenes could be one of the chief language learning activities in the early stages of program use, and a good way of introducing the program to pupils. Moving on to simple animations would be a good way of exploring verbs, for instance. Situations involving interaction between characters, animals and props could provide a stimulating way of practising simple commands and requests, initially expressed verbally and perhaps later inserted in written form in speech balloons. The teacher might even insert written speech balloons herself into the students' scenes and have them record the dialogue using the text-to-speech facility as a guide. As children's grasp of the target language develops, the potential for richer narrative development will increase. Obviously, as with all the programs examined in this paper, it will be the teacher's responsibility to ensure that the creative effort dedicated to constructing scenes, situations, animations, etc. does not totally overshadow focus on the target language.

Fig. 1. Story Maker 2

Designed for slightly older students, **Kar2ouche Composer**[5] (Fig. 2) makes it possible to create talking comic strip type stories with three-dimensional images, speech/thought balloons and captions space. The procedure for building a narrative is similar in some respects to that in Story Maker, though being aimed at an older target audience, Kar2ouche Composer does feature somewhat more sophisticated controls. Students have up to four audio tracks available for the voice recordings, music and sound effects that are to accompany the frames: an editing control panel makes it possible to set the duration of each panel and the length of those recordings, so that the entire narrative can be played back as a multimedia film, albeit as a sequence of still frames (if desired, a staccato-type of movement can be achieved by rapidly "flicking" frames, though the program is clearly not designed with animation in mind). Kar2ouche Composer's comic strip format focuses attention more closely on developing narrative through dialogue, so for foreign language use it is more suitable for lower secondary school and above where students' grasp of the target language (and of social interaction) is more developed. The program's characteristics make it extremely useful for creating simulated role-plays, which might subsequently be performed by the students in class; alternatively, the digital story might be the culmination of classwork and could thus be the basis for evaluation.

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[5] Published by Immersive Education Ltd., 2003 - http://www.kar2ouche.com/imed/

Fig. 2. Kar2ouche Composer

By the same publisher, **Media Stage**[6] (Fig. 3) (2004) allows students from secondary school upwards to create short 3D animated films that end-users can explore by navigating freely within the 3D spaces. The narrative creator/s can "direct" virtual characters by determining their movements and gestures, and also by getting them to "recite" the lines of dialogue attributed to them: these can be written by the students themselves or taken from the program's database of English phrases and expressions. These lines of dialogue can either be recorded by the students themselves or reproduced by a text-to-speech engine: in the latter case the program generates automatic animated lip synchronisation to create a more realistic impression of speaking. Sophisticated controls are available for determining lighting effects, camera angles, etc. Media Stage is designed chiefly for exploring the characteristics and dynamics of film and video making and could prove a bit complex for use in the foreign language classroom. That said, the possibility of producing an animated narrative in a virtual 3D environment makes this program particularly appealing to visually-oriented, computer-savy students, especially those keen on films and on video and computer gaming. The user can attribute certain behaviours and emotions to the characters, which the program reproduces automatically in their movements and gestures, and this feature could prove an interesting area to focus on for language learning purposes.

[6] Published by Immersive Education Ltd., 2004 - http://www.kar2ouche.com/imed/.

Fig. 3 Media Stage

An altogether different product for creating multimedia-based narrative is **Theatrelab**[7] (Fig. 4) since it combines both traditional and innovative elements within a single integrated system for creating and performing theatre plays as collaborative, intercultural and multilingual projects. The system integrates a multimedia authoring platform for developing the play and a traditional mini-theatre made of wood, which is used for staging the theatre show in live settings, with the support of computer-based elements.

Using the control panel within the multimedia platform, "the authoring team" can develop a script, design the sets, choose the characters, record the dialogue parts, include music and sound effects, and give stage directions. The various multimedia components within the "production" comprise a single virtual kit, which can be customised at will (generating a new offshoot kit) and shared with others for collaborative development. The multimedia platform also provides an interactive "studio" for previewing and controlling the whole production as it is being created (front-view and top-view), allowing easier editing and control: the characters move about as directed on the specially created sets and "recite" their voice-recorded lines over a layer of sound effects and music: multilingual subtitles can also be added.

This multimedia lab can be both a studio for (full) development of the project and a support for live theatre performance. The wooden theatre is decorated with scenery designed on the computer platform, and the figurines representing the various characters are fixed onto magnetic mounts and moved like puppets, only the puppeteers are positioned laterally and move the characters using magnetic staves manoeuvred underneath the stage. Voices, music and sound effects may be mixed and reproduced via computer, as can any subtitling.

[7] Published by Thinkup.net 2004 - http://www.thinkup.net/

The possibility to add subtitles in one or more languages and to switch interface language with ease make this system particularly well suited for projects with a collaborative, multilingual dimension and in such cases foreign language learning is often a prime objective.

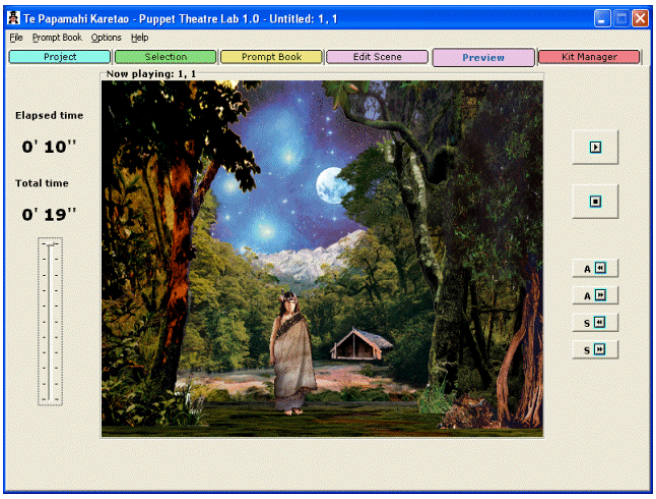

Fig. 4 Theatrelab

Lastly, it is worthy considering an example of "open" narrative-based language software that is available on the web: **D.Film Moviemaker**[8] (http://www.dfilm.com/index_movie_start.html) (Fig.5). With this program students can create short comic-strip-type animated cartoons simply by selecting from the set range of backgrounds, characters, situations and music on offer, and then inputting their own dialogue text and titles. The result, which can even be sent to others by e-mail, is a personalised comic strip with a very limited degree of animation: the characters simply move in and out of frame according to the type of situation selected (rendez-vous, pick-up, chase, soliloquoy). The attraction of this program, apart of its ease of use, lies in its potential to enhance student motivation for creating dialogue-based narratives, though without voice recording. It does not provide the same flexibility for narrative development compared with the software examined above, nor does it feature specific language learning tools. Nevertheless, it remains a fun way of working with dialogues in the foreign language class, particularly at secondary school level.

[8] Last visited 07/04/2005

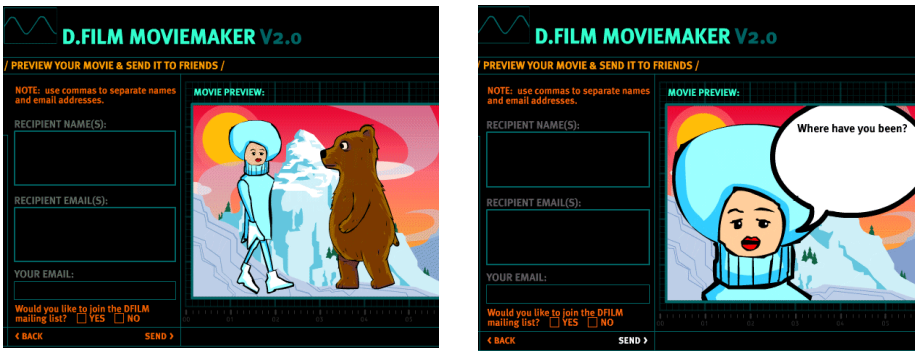

Fig. 5. D.Film Moviemaker

4. The potential of narrative-based software

If the programs examined above are to be used effectively and profitably in young people's language learning, the teacher (or teachers) will need to ensure that narrative production forms part of a well defined path that sets students clear language learning goals: students very quickly sense when this is not the case and their reaction can undermine the whole effort. It will be the teacher's responsibility to choose the most suitable program, particularly in terms of the communicative skills that the program entails, the types of learners involved and the roles they are to assume.

In order to identify the added value that narrative-based software can bring to language learning, it may be useful to take a look at some of the potential disadvantages of drama and dramatization in the language class that are examined in the literature. Wan [12] states that it is sometimes considered a contrived activity that is unsuitable at beginner level; that it is difficult for the teacher to monitor and can prove unwieldy because s/he may fear losing control of the learning process and find it difficult to pace lessons; performance can cause embarrassment to some students (especially those from cultural backgrounds where individual expressiveness is somewhat frowned upon) and inhibit spontaneous use of target language or even encourage the use of incorrect forms.

The adoption of computer-based tools for narrative creation such as those described above could go some way in overcoming these potential drawbacks. First of all, the activity of creating multimedia narratives is a very concrete one to students and by no means artificial: they are surrounded by such products, often interact with them and are usually eager to try their hand at producing them. These programs provide young learners with powerful tools and a wealth of resources that enable them to construct stories in an intuitive manner, beginning with the basic elements of their narrative (scenes, characters, props, etc.). As studies have shown [7], working with images helps the young language learner understand and create narratives. With respect to monitoring student activity, narrative-based software makes life

considerably easier for the teacher, who can get a fairly clear idea of what progress has been made at any point of the project simply by comparing the different versions of a story, dialogue, etc. that emerge from successive work sessions. In the same way, the teacher can also identify what target language issues are arising, which s/he can analyse and address at an opportune moment. The ease with which narratives can be created helps to keep young students very focused on the activity, which makes classroom management less of a problem: obviously close teacher supervision remains crucial, as does lesson pacing. The embarrassment (even trauma) sometimes caused by having to perform in front of others [8] can largely be overcome by using a multimedia authoring program; indeed from the affective viewpoint, this is one of the chief advantages of working in such environments [2].

Involving students in a collaborative effort aimed at the creation of a tangible, and meaningful, final product brings a number of advantages to the learning process [9] particularly with regard to motivation, which is without doubt a key factor in young people's foreign language learning.

Producing narratives using programs such as those we have looked at in this paper provides a good opportunity to motivate pupils through project-based student-centred learning. When this is combined with the advantages of using multimedia for narrative based language learning [1] we not only have strong motivational impulse to use the target language, we also have opportunities to construct truly inclusive learning environments in which students can participate according to their level of language ability, the learning style they prefer, the particular type of intelligence they favour. Indeed, software such as those exemplified in this paper provide a golden opportunity for language learners to work co-operatively in a group effort in which each individual has the chance to experience narrative creation in a way that best suits him or her. In accordance with Gardner's theory of Multiple Intelligences [4], students who are visually-spatially strong would benefit greatly from working with images, the more linguistically oriented could concentrate on language production, while the more musical minded could contribute a musical score and sound effects. Kinaesthetic learners will appreciate the learning by doing approach implied in software-based narrative production (especially where animation is involved), while those who have a strong interpersonal intelligence might well play a guiding role in the collaborative effort. Those who tend more towards the intrapersonal are likely to be sensitive to the feelings and emotions of the various characters in the narrative and might be encouraged to explore this aspect. The possibility to participate in collaborative effort according to one's personal aptitude and interest allows the learner to engage with peers, helping them to support each other and extend language skills. This brings into play the students' Zone of Proximal Development (ZPD), described by Vygotsky as "the distance between the actual developmental level [of the child] as determined through problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" [10].

Another important way to foster young language learners' motivation is to engage them in learning environments which give them confidence in expressing themselves in the target language One of the characteristics of ICT tools that can help boost confidence is provisionality, namely the possibility to produce draft versions which can easily be reworked until a satisfactory result has been reached. More generally,

provisionality can bring impetus to the creative process itself, especially in group work, where the possibility to try out alternative strategies and solutions without risking any "damage" to the final product can facilitate participation and decision making, thus rendering collaboration easier and more fruitful.

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Speak for Yourself! Developing Narrative within a Multimedia, Multimodal ICT Environment

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Abstract. This paper presents a case study set in the U.K. context of an increasingly technological society, where there is an emphasis upon both ICT excellence and literacy standards, resulting in the development of multimodal literacies, offering potential benefits to students who have difficulty accessing 'traditional' literacy. As the idea of difference of development, based on positive definitions of the learner, played a central role in this study, the research focus considered the process, rather than the result. Through a detailed analysis of the student's processes when creating stories with multimedia software, emergent themes led to categories of analysis, thus supporting final conclusions. The sociocultural environment was taken into account; interactions between the student and the computer, and between the student and the researcher, were considered, with a particular focus on the spoken word. Findings suggest that the multimedia environment allowed for the development of narrative aspects of story creation and contributed to the development of an autonomous working style.

I believe that if we are to have new forms of learning, we need a very different kind of theory of learning. The theories that have been developed by educational psychologists and by academic psychologists in general, are matched to a specific kind of learning. School's kind. As long as these ways of thinking about learning remain dominant, it will be very hard to make a serious shift from the traditional form of School. (Papert [3, p.21])

1 Introduction

This paper considers how a student receiving special educational provision used an Information and communications technology (ICT) multimedia environment to develop the narrative feature of his stories. Whilst the actual research activity focussed on three case studies, this paper will consider the case of Kurt, a twelve year old, Year 7 student, attending the special needs unit of a comprehensive, secondary

school. Kurt had been placed in the special educational needs (SEN) Unit[9] because the local education authority (LEA) had assessed him as having social communication difficulties; he was also considered to be dyslexic. However, the teaching staff felt that he had 'quite a high level of communication' and that his problems were more behaviour–related. His teacher said, "He is dyslexic and doesn't like writing at all, but is quite happy to do work on the computer. In fact he chooses, if he's got the opportunity, to work on the computer, rather than write." It is important to note that the culture of the School was such that spelling was a prime concern; Kurt found spelling difficult and was anxious in this regard. Additionally, his reading ability was limited, and handwriting was difficult to read and poorly presented. Although his verbal skills were stronger than his written skills, he nonetheless lacked vocabulary and had trouble in communicating clearly. The staff selected Kurt for this project because they felt that he would benefit from working in a one to one relationship and that, because of his positive attitude towards computers, working with them would help his self-esteem.

Whilst there is much rhetoric surrounding the use of diverse forms of ICT in schools, there remains a need to provide evidence as to the value of such activities. Whilst the research aims were to investigate ways in which students with special educational needs produce multimedia stories, analysing the role of the zone of proximal development (ZPD) with respect to literacy learning, the outcomes highlighted the importance of utilising the multimedia as a narrative device, developing interactivity between the story and the reader. For the purpose of this paper, it should be noted that use of the term 'narrative approach' simply refers to characters within the stories speaking for themselves, in the first person, as opposed to the use of reported speech.

The study was framed by socio-cultural theory [8] [10] and a qualitative methodology underpinned the actual research activity and its data collection and analysis, with consideration of interactions between students and computer, and between students and the researcher, taking the sociocultural environment into account. The study was underpinned by literature that viewed Special Educational Needs through the lens of a sociocultural framework, but this was expanded by addressing how those ideas might be extended by the use of ICT tools within a framework of multi-literacies.

Salomon, Perkins, and Globerson [6] describe the effects of working with technology as that where the combined efforts of the learner plus the technology enables that which would be unachievable by the learner solo. There are many potential benefits to an educational orientation towards the person-plus, empowering learners to capitalize upon cognitive resources and developing their own 'plus' system. Perkins [4] addresses the question 'How do thinking and learning happen?' He suggests several theories, which attempt to answer the question, but notes that there is always the difficulty of separating the person from the resources in trying to arrive at the answer. Consequently, he queries whether the question might be answered by assessing the person plus the resources.

[9] The SEN Unit is an adjunct to the main school and caters for those students deemed to require additional help with their learning. These students therefore attend lessons both in the main school and, also, in the SEN Unit.

The context of literacy changes when approached through computers and, particularly, multimedia. Multiple literacies make new demands on readers and writers and on those who are helping students to develop their literacy skills. Moreover, in line with Kress' [1] arguments that we change language by using it, so we are actively involved in shaping the technologies we use.

Vygotsky [9] maintained that a child might be held back in their development by the way in which they are viewed socially and, consequently, the social experiences that are open to them. He states that, rather than being less developed than other learners, they have merely followed a different developmental path. An example of this 'difference of development' can be seen in the following quote, relating to autistic children:

> *Children in school learn about the five senses but not necessarily through them. In autism, however, it seems that sensation persists as a meaningful route to understanding beyond the stage of mental development where it is normally relegated to the status of a less than efficient way of finding out about the world (except of course in particular domains). The 11-year-old child with autism who persists in "tasting" new people he encounters is acting in what is for him a problem solving, information seeking way.* (Powell, [5, p.114]).

Research methods included interpretation, reflexivity, deconstruction, discourse and notions of multiplicity. The teacher/researcher provided lessons and intervention techniques. The multimedia authoring software *TextEase 2000* [i] was used to assist Kurt in creating his stories. The program allows for word processing, desktop publishing and multimedia authoring. This software was chosen because it is intuitive to use, offering the flexibility and power of Microsoft's *PowerPoint*, whilst making fewer cognitive demands on the user. It was anticipated that this software could be used to allow for the development and investigation of different literacy genres and, from the outset, the stories were viewed in multimodal terms.

The research study was divided into two phases, each comprising an approximate total teaching time of four hours, with the format of each phase remaining the same. In this way, Kurt was able to become familiar with the researcher, the software, the aims of the study and the working environment during the first phase, whilst the second phase allowed him to extend and develop his skills and expertise. As Kurt was unfamiliar with the software, a training element was incorporated into the first phase of the study; the activities were based on work with which he was already familiar so as to allow him fuller concentration on the processes involved. This meant that he produced his own version of the Anglo-Saxon story of Beowulf. The format, then, was broadly as follows:

Lesson 1	overview of the software and developing a resource bank
Lesson 2	making collages to be used in the story
Lesson 3	learning to use a scanner
Lesson 4	video recording acting and importing video clips into the software
Lesson 5	adding components to the resource bank and starting the story
Lesson 6	completing the story

The second phase of the project extended those skills which had been developed in phase one, allowing Kurt to work with greater independence and concluding with him making his own story, based on the theme of 'finding things'. The story of 'Skellig', written by David Almond, was used both to introduce and initiate this activity, encouraging consideration of ideas and vocabulary.

Kurt was required to develop his own resource bank prior to embarking on his story creations. Consequently, he was provided with a story plan to help in mapping out his ideas, and was given a disposable camera so that he could collect pictures for his story. He was also provided with a checklist to ensure that he had fully considered both vocabulary and the various multimedia components available to him, such as pictures, animations, sounds and video. The checklist also reminded him to consider design aspects such as background colour/design, font colour, font size, font style, freehand drawing and speech; linking images to text, sound, speech and video. Thus, although the story creation itself was fairly open-ended, the actual activity was tightly structured; Kurt generated a portfolio of individual achievements.

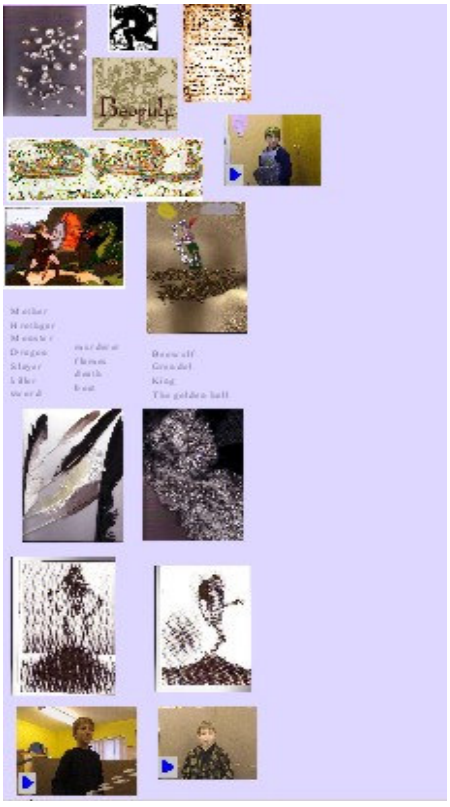

Fig. . Resource Bank - Beowulf

2 Telling Stories

Kurt's stories tended towards a story format with which he was already familiar but he was also keen to select, create and utilise multimedia within his productions and it was apparent that he perceived this as integral to the overall design of the stories, which were not viewed purely in written terms. Viewed through the lens of a semiotic framework [1] this diversity of symbols of communication should afford a greater freedom, and opportunity, for users to become 'meaning makers'.

2.1 Kurt's Beowulf Story

Figure 1 shows the resource bank, which Kurt produced in phase one, when re-creating the story of Beowulf. Although I encouraged him to add vocabulary that he thought he might find difficult to spell, or which might be useful in reminding him of the story, he was much more interested in adding visual components to the resource bank, which is dominated by images. Kurt was resistant to writing but was confident in his artistic abilities and it seems that he was prioritising what he considered his area of strength when compiling the resource bank. The images he used were scanned from books, his own collages and three video clips of him acting.

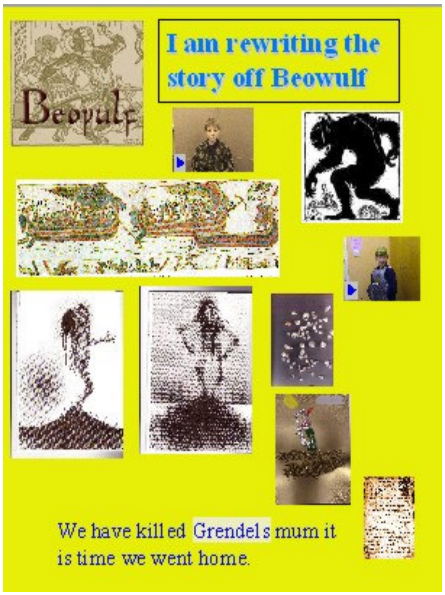

Fig. . Story - 1 – Beowulf

Reading from left to right, (Figure 2) Kurt started with a picture taken from the book of Beowulf and overlaid speech onto it, resulting in an image, which read, "*This is the story of Beowulf*". Not only has Kurt ensured that the reader is aware of his

story content but, from the story's beginning, he has made it clear that it is interactive. He reinforces his intentions with writing, placed in a text box that, in both size and style, could be seen as a title. It reads, "*I am rewriting the story off (original spelling) Beowulf*". In effect, Kurt had opened his story twice, once with sound and image and then, separately, with words. This is followed by a video clip in which Kurt, acting the part of King Hrothgar, explains to the reader, "*Cause this nasty beast comes in at night and scoops up thirty people. Soon we'll have hardly any people left to fight him.*" The next picture reads, "*I am Grendel. I'm going to eat another thirty people for tea!*" Kurt was, then, utilising the multimedia by choosing for the characters to tell their own story. However, this results in key points of the story being told, with little connection between one event and another. He continued with this method: the picture of the Viking ship read, "*We are on our way to help the King.*" Then there was another video clip of Kurt acting a fight with Grendel: "*You tried it again, but This time we have got you! Off with his head! You can run but you can't hide! We are fed up with you. You can run but you can't hide! (Fight noises).*" The following picture of Grendel, by way of explanation, said, "They got my arm!" The next picture, however, merely explained itself - "*I'm Grendel's Mum and I live in the caves.*" A collage of shells to which a sound file was attached followed this. It was 'vocally labelled' and read, "*These are the caves.*" Kurt also used his collage of Beowulf, which read, "*This is Beowulf. I made him myself.*" Kurt made his ownership of this work explicit. In fact, that which he made the character say, does not add anything to the actual story but it *does* tell the reader that Kurt was responsible for the work. The sound, then, was used to provide information about the creator rather than contributing directly to the story line. The story appears to end with writing at the bottom of the screen, which says, "*We have killed Grendel's Mum, it is time we went home.*" However, next to this, on the bottom far right of the screen, Kurt has placed a picture of an old manuscript with attached sound, which concludes, "*This is proof of this story.*" He has understood the 'manuscript' to be an old document - an historical source - and has used it to substantiate the story. This indicates that he was applying knowledge learnt in other curricular areas, such as history, to strengthen his tale. In addition, just as he did at the start of the story, Kurt ends it in two different ways; firstly, he ends it with writing and then, separately, he uses sound and image.

2.2 Kurt's 'Finding Things' Story

In the resource bank, which Kurt created in the second phase of the project (Figure 3), for the story entitled, 'Finding Things', he included vocabulary, but decided against making video clips. However, he continued to focus on image, this time adding six animated .GIFs (Figure 4). This, combined with the tiled background, makes it difficult to read the text but he did not perceive this as a problem, perhaps because he intended the story to be read by the program, rather than the reader. Not only does the auditory input minimise the importance of seeing the words but, also, when the program reads the writing, the words are highlighted and so become more visible.

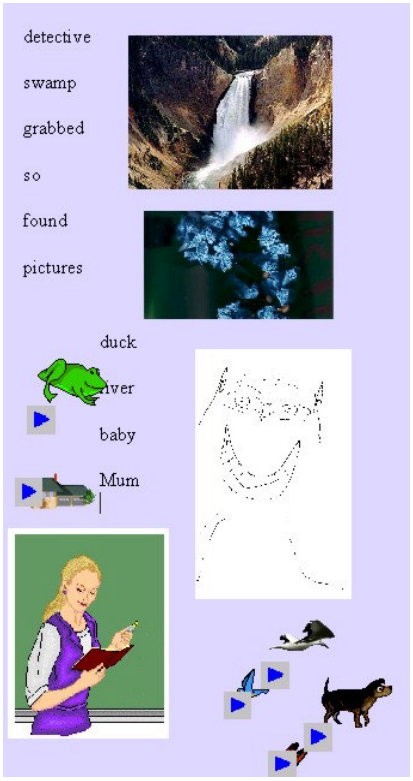

Fig. . Resource Bank - Finding Things

As with his previous story creation, Kurt attached sound to most of the images. However, progression can be seen from his first attempt in that he has learned how to superimpose the image of the frog onto the collage of the pond, with each image having a separate sound attached to it. The storyline was as follows: A mother took her baby to the park but he went missing. After searching for him without success, she sought assistance from a detective, who tried to find the baby. Then she received a telephone call from a kidnapper who told her to return the park with one thousand pounds, ensuring that no police would be present, and then he would return the baby. However, before returning to the park, the mother rang the police, telling them to meet her at the park to catch the kidnapper but to make sure they did not use sirens or her baby would be killed. On meeting the kidnapper, she refused to hand over the money until she had her baby, at which point police jumped out from a bush, shooting the kidnapper five times in the head. The story ended with the mother taking the baby back home.

Kurt had set the story in a park near to his home, which had a waterfall, hence the tiled waterfall background. He did not introduce writing at the beginning of the story but, rather, set the scene visually and aurally with animated .GIFs of birds and a frog on a pond – all appropriate semiotic devices to convey the notion of 'park'.

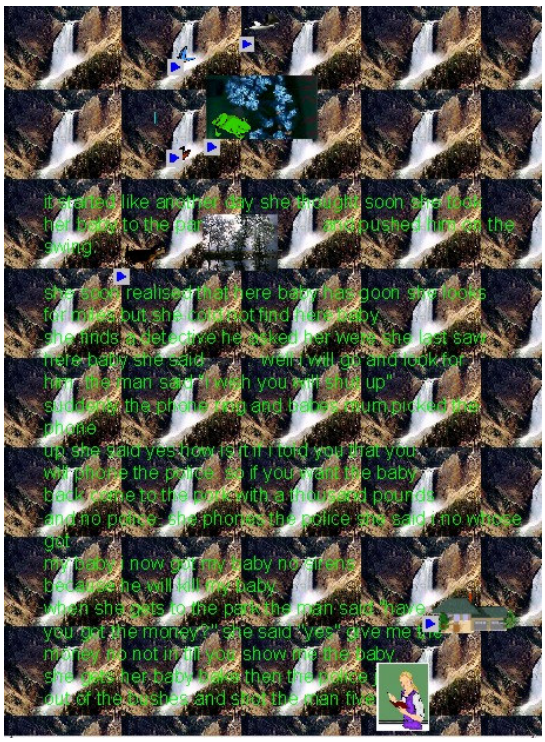

Fig. . Story of Finding Things

Kurt recorded his own voice, saying '*Gribbit*' to attach to the frog and recorded the sound of water splashing for the pond. Then, using words, he set the context of his story. An inset picture of trees, to which Kurt had attached the sound of a duck quacking, immediately followed this. Writing made up the middle section of the story but, towards the end, Kurt once again used image and sound. He had recorded himself singing '*Home sweet home'*, and attached it to the .GIF of the house. He also recorded me saying, '*My baby's home, hip hip hooray*' and attached it to the picture of the 'mother'. Just as he had done with his first creation (Beowulf), Kurt made the characters within the story speak for themselves but the increased use of writing in this second creation meant that the key events were joined more cohesively. The increase in writing was intentional on Kurt's part and, when asked, in the postresearch interview, why this was, he replied, "*Cause I just felt like, no more, not too many pictures this time"*, indicating a refinement of his techniques. However, the multimedia components added extra dimensions to the writing and resulted in an interactive story.

Kurt spent considerable time deciding which materials would best portray the required images; when deciding whether to use mung beans or dried peas to show 'grass', he finally selected the mung beans as they were greener than the peas. It is

interesting, then, to note that he showed the same 'perfectionism' in making his story: the images had to be exactly what he wanted, and to perform in exactly the way he had envisaged – he was not content to 'make do' in this regard but capitalised on the ability of the multimedia to synthesise the visual, oral, aural, spatial, dynamic and semiotic aspects of the creations.

From the start, Kurt made it very clear that his stories were interactive and used a combination of semiotic means to convey his meaning, making his ownership of the work explicit. The second story was set in his own locale and centred on himself and his own experiences. He elected to use a narrative approach, whereby the characters told their own story and he attached sound to most of the images. However, he used words to set the context and writing also made up the middle section of the story but, towards the end, he once again used image and sound.

3. Talking About Stories – Conclusions Drawn

Kurt was very clear about how he wanted his stories presented. He was keen to attach sound to image and was definite about the type, size, style and colour font he intended to use, as well as considering the background design, or colour. In the second phase of the research, Kurt's story pivoted around him, his family and friends, school and home locations. Though this may have occurred anyway, largely it was afforded by the incorporation of personal resources such as photographs, recordings etc. Additionally, he often made the characters within the story speak for themselves, which is the start of a different approach to story making, where the narrative becomes increasingly important, and the characters are, quite literally, given a voice.

Vygotsky [9] said that for abstract thinking to develop, the activity must be one that the students found appealing and which held a genuine interest for them. Because ICT was central to this project, it was perceived as a high status activity and Kurt was enthusiastic about taking part. He was also keen to select, create and use multimedia within his productions. The ability to incorporate personal resources such as photographs and audio and video recordings resulted in stories that pivoted around him and his personal life. Additionally, because the program read his work back to him, it made Kurt not only the producer but also the audience of his creations.

Kress [1] believes that illustration has as much, if not more, to say about the story as the writing – the two combine to form a whole and are not complete without each other. Indeed, it quickly became apparent that Kurt perceived multimedia as integral to the overall design of his stories, playing a central part in developing interactive creations, which were not viewed purely in word form. Furthermore, the multimedia was used to convey story genre and sound played a particularly important role in that it contributed to a narrative approach. However, it is not only access to literacy which is important but, also, that the mode of literacy should be perceived as important (Kaestle in [7]). Kurt has received years of schooling, which have emphasised the importance of writing over almost everything else, and he had some difficulty in moving away from the traditional text -based form with which he was familiar. To some extent, this hampered his 'vision' in terms of what was actually available to him when using this medium, as did his concern with correct spelling.

This study aimed to explore whether ICT was able to bring about a multiplicity of new literacies and it seems evident that this has been the case. However, what also became apparent was the way in which Kurt focussed on using a narrative approach within his stories. Although, initially, this meant that there was little cohesion between the story events, as he refined his process he increased the use of writing resulting in the key events being joined more cohesively. This increase in writing was intentional on Kurt's part and indicated a refinement of his techniques. However, the multimedia components added extra dimensions to the writing and resulted in an interactive story. For example:

Interviewer:	*So, tell me about this wonderful waterfall in the background – what's that about?*
Kurt:	*Umm, we got that for a reason.* ***Cause the waterfall makes the picture seem like um it's telling us instead of us telling it.***

Given that narrative is of central importance to our ability, both individually and as a society, to 'tell stories', and thus to communicate effectively, it is essential that students learn this skill. Whilst SEN students are often well able to do so in spoken form, in the written form this facet of language can present difficulties for them. Indeed, this aspect of language is highlighted in *The National Literacy Strategy* which demands that students should be taught how dialogue is presented in stories and to be aware of the difference between a narrator and the different characters used in a story, or play.

Within this multimedia environment, where the design of the stories is not viewed purely in written terms but, rather, is a combination of illustration, multimedia components and writing, the use of narrativity contributes to the development of nonlinear story forms. However, this conflicted with Kurt's previous experience and even though the multimedia environment offered an ideal medium to develop this organic approach, he found it difficult. His work erred towards a 'traditional' linear approach, rather than utilising the ability to develop the stories in a more horizontal, or organic way, though his second story did start to move in this direction and what, perhaps, should now be established is how this narrativity might promote different ways of thinking and understanding.

There are important pedagogic implications attached to students utilising the multimedia as a narrative device, developing interactivity between the story and the reader. For example, the ability to incorporate personal resources such as photographs and audio and video recordings resulted in stories that pivoted around the student and his personal life; multimedia was integral to the overall design of Kurt's stories, playing a central part in developing interactive creations, which were not viewed purely in word form. Furthermore, the multimedia was used to convey story genre and sound played a particularly important role in that it contributed to a narrative approach.

Because of the work that Kurt was doing with me, both his class teacher and fellow students perceived him as having superior 'technical' skills. Other than this, Kurt was not, generally, seen as having any particular area of strength and it may well be that this boost to his confidence inspired greater competence. Central to Kurt's development was that he came into contact with, and, to some extent, created, both his surroundings and himself through the actions in which he engaged [10, p.8].

Traditional literacy activities are often de-contextualised but this study has shown that, given a choice, students select methods and resources, which provide a context of personal relevance and importance. Further, the ability to create interactive environments necessitates a consideration of abstract concepts such as time, space and reader intervention. Kurt was motivated to engage with the writing process, even though this multimodal literacy made heavy demands on his thinking skills and required that he was actively engaged with the task. The way in which Kurt approached, and undertook, the creation of his multimedia, multimodal stories, highlights the way in which he was able to make clear design decisions, capitalising on his areas of artistic and verbal strength, and contributing to the development of an autonomous working style, thus demonstrating that SEN students are both capable and literate, when regarded from the perspective of multiliteracies, and highlighting the unhelpful way in which they are presently situated in relation to a restrictive, singular view of literacy that privileges writing [2]. Relieved of these restrictions, Kurt developed some ability to work independently, generating a newfound confidence. However, Schools remain resistant to change, as can be seen in its resistance to divergent literacies. Implementing the changes necessary to support the development of divergent literacies within schools requires a less prescriptive curriculum and a means of assessment that allows teachers to credit students for their accomplishments in this regard.

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Reflective Narration via E-mail: Conducting Design-Based Research in Primary Schools

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Abstract. Research is presented on the use of e-mail to establish a narrative learning environment in which children learn to reflect on lessons taken and on their own role in these lessons. To gain a full insight in the role of narration in primary school education, three perspectives are proposed: (1) the act of narration, (2) the rhetorical statement, and (3) the story. Furthermore, design-based research is proposed as a fruitful way to investigate the richness and functionality of narrative learning environments. A design experiment is presented in which 12 groups of grade 5-6 students e-mailed reflective narratives to a partner group at another school. The implementation of e-mail in the classrooms, the rhetorics and the stories produced are described. It is argued that using e-mail for narration promotes personal reflection on oneself and on other group members in relation to both the process and product of learning.

1 Introduction

Narration lies at the heart of human thinking and learning as the most natural and earliest way in which we organize experiences and create personal meaning [1][2]. Schools should therefore facilitate its occurrence in the classroom. However, schools generally give their children relatively few opportunities for narration. The prevailing classroom dialogue is the IRF-pattern in which the teacher Initiates, the learner Responds, and the teacher provides Feedback [3][4]. These dialogues do not use narration as a central mode of thinking and give children little opportunity for practicing and improving that mode. The study presented in this paper was part of a larger research that set out to develop narrative learning environments by using a readily available means: e-mail [5].

In this paper, two issues from that research are put central. First, based on the work of Genette [6] and Conle [7] it is argued that to successfully embed a narrative learning environment in primary school curricula one has to look at narration from three perspectives: (1) the act of narration, (2) the rhetorical statement that is produced in the act of narration, and (3) the story that is produced in the act of narration. The data that are presented illustrate how these perspectives help to develop a holistic view on the potential of narrative learning environments.

Second, the paper argues that design-based research is well suited to gain insight in narration. The past few decades there has been a growing awareness of the contextual

nature of learning [1][8][9]. One methodology that takes this into account is design-based research in which design experiments are conducted in natural settings by implementing instructional designs and observing emerging practices. The design experiments follow one another and aim at "systematically adjusting aspects of the designed context so that each adjustment served as a type of experimentation that allowed the researchers to test and generate theory in naturalistic contexts" [10]. It is argued that to gain insight in the richness and functionality of narration, conducting design experiments is a fruitful approach. In this paper, one of a series of design experiments is presented.

2 Three Perspectives on Narration

What is narration? And what does it look like in the context of education? In its most general sense, narration can be described as an act of articulation in the form of a chronicle with specific narrative characteristics. The following characteristics are mentioned in the literature: a description of events organized in a plot with a beginning, middle and end, and a narrator's point of view from which these events are told [1][2][11]. In other words, a narrative contains a chain of events organized into a coherent schema from a personal perspective (i.e., the narrator). Sequencing makes visible the connection between events in a plot. And a narrator's perspective brings to light intentions, interpretations, and evaluations related to these events.

In many definitions, narrating is narrowed down to a literary endeavour of telling a specific kind of story in a specific literary structure. The focus is on classic literary stories. No distinction is made between different forms and functions of narratives, and between the different media in which narrating takes place. In the context of education, however, such a distinction is critical. First, defining narration should distinguish between different narrative forms. Research shows that children's narratives take different forms depending on their intentions and on the instruction that is given [11]. Champion [11] argues that different structures should not be treated as deviations from the ideal (i.e., the literary story), but should be acknowledged for what they seek to achieve. Second, defining narration should distinguish between the many functions it can have. Narration in education can be aimed at a diversity of things such as conceptual understanding [2], moral development [11], and reflection [12]. Each function demands its own way of support and evaluation. Third, defining narration should distinguish between the media in which it is realized. For instance, narration can occur oral or written, electronically or on paper, collaboratively or individually. In short, to embed narration in educational settings, an approach is needed that takes into account its form, function, and medium.

Conle [7] after Genette [6] proposes three perspectives on narration that can help exploit the potential of narration in education. The first perspective is the act of narrating. It depicts narration as an act that originates in someone's willingness to tell a story in a certain context. Many contextual factors influence this willingness, for example the availability of tools, the audience, and the atmosphere in which one has to produce a narration. The second perspective is the rhetorical statement. It depicts narration as a communicative act in which a narrative statement is produced that has

certain rhetorical characteristics to convey the message. Examples of narrative statements are a written journal, an oral presentation, a letter, or a literary story. Examples of rhetorical characteristics are enumerations in sheets used with a presentation, greeting rituals in a letter, and indirect speech in a literary story. The third perspective looks at the story, i.e. the content that wants to be told. This perspective resembles the general definition of narratives given above.

In this study, the aim was to implement narration in lessons for the purpose of reflection. To provide the children with the means and motivation to narrate, e-mail was used for the exchange of narrations between groups of children at different schools. Conle's three perspectives are applied to this context. They provide a framework for the instructional design as well as the analysis and presentation of collected data.

3 Is E-mail Suitable for Narration?

There are several reasons why e-mail can be expected to support writing in general and reflective narration in particular. First, e-mail has a hybrid nature that combines characteristics of oral and written communication [13]. In general, children find it more easy to talk than to write [4][14]. Although Baron [13] argues that e-mailing is hard for children because it is a form of writing, the talkative character of e-mail might actually help them to write with more ease. Children can apply their implicit knowledge about having an oral conversation to the written communication [15].

Second, e-mail use means writing for a real audience. Preserving the communicative character of writing was found to be motivating because it makes the writing task more authentic and goal-directed [14][16]. Research on e-mail use in the classroom confirms that learners find it motivating when their writings are actually read by others [17]. The audience also helped learners notice details that needed to be further explained to distanced others, emphasized the need for a coherent story, and stimulated an attendance to esthetic aspects [17][18].

Third, e-mail allows learners to take control and have a 'private' conversation without interference by a teacher. Computer use in general has found to promote learner-centeredness. For instance, Wegerif [19] showed that working with the computer can change the IRF pattern in an IDRF pattern in which the D stands for independent Discussion between learners. The computer structures the learning activity and allows for independent deliberation. Because e-mail is an open-ended medium that provides a format for communication without setting its content, it raises opportunities for independent knowledge construction by users [20][21][22].

We also expect e-mail to be suitable for reflection. E-mail is an asynchronous medium and therefore creates the time needed to reflect [22]. Another reason why e-mail is deemed suitable for reflection is the fact that its participants are distributed at different places which fosters awareness of differences and self-explanation [17][22]. In her report on e-mail use in a primary classroom, McKeon [23] concludes: "Using e-mail gave the children a chance to 'make public' their individuality. Perhaps this occurred because the children were initially unfamiliar with their partners and wanted to share knowledge about themselves in order to establish a relationship with a new

person. If so, classroom e-mail partnerships may provide students with a new way to learn about themselves as they select information that defines who they are and send it via e-mail to another" (p.703).

Although e-mail seems a promising tool, important impediments are also present. Difficulties concern unsatisfactory writing and typing skills [18][24], a dislike for writing with some pupils, and a lack of awareness of writing as a learning activity through which experiences can be reconstructed instead of merely reproduced [25]. Therefore, attention needs to be paid to the establishment of a positive classroom climate, and the development of an e-mail writing task that is perceived by the children as authentic and challenging. In addition, children's writing and typing skills need to be taken into account.

4 The Design Experiment

4.1 Participants

Three schools voluntarily participated in the design experiment. The schools were sited in villages in a rural area of Enschede, the Netherlands. The schools participated with one classroom each (grade 5-6, aged 10- 12). In total, 12 groups participated. Two schools had normal student populations (schools 1 and 2). The other school (school 3) housed only two children because of closure at the end of the school year.

The schools had access to at least one computer connected to the Internet and the teachers were familiar with the basics of e-mail software. The children varied in their experience with e-mail at home. E-mail had not been used in two of the classrooms. In one classroom, initial steps had been taken to teach the children the use of word processors and e-mail in the months preceding the project. The schools had some experience with working in groups. In the school with two children, working independently through an individual program was the standard.

In a face to face meeting with the teachers, the lesson materials were introduced and an e-mail schedule between schools was set. During the project, the teachers stayed in touch via e-mail to share experiences and inform each other about any change of plans.

4.2 Embedding E-mail in the Design Task

E-mail use was embedded in a design task in the domain of biology that comprised six lessons of two hours each in which the children worked in small groups (2-4 children) on the design of an ecosystem. In each lesson, e-mail was used for reflective narration. The assignment given to the children was "to write about the passed lesson, what they had been doing, how things went, how they had been working together, and if they were pleased with it". No further specifications how to write narratives were given. MS Outlook™ was used to send and receive the narratives to a partner group doing the same lessons in another school.

Four measures were taken to support reflective narration with e-mail. First, partnership was fixed by pairing groups from two schools who exchanged e-mails with each other during all lessons. Making clear who e-mailed to whom and fixing this partnership was viewed essential for building strong and meaningful work relationships [26][27]. Second, two e-mail moments were determined within lessons. The groups received e-mails before working on the design task, and wrote e-mails after working on it. As a result, the design task became embedded within moments of reflection. The groups sent and received one message per lesson. As a result, a zigzag pattern between groups emerged. For instance, school A sent and received e-mails on Tuesday, and school B on Thursday. Third, a paper worksheet was provided displaying an e-mail format. The worksheet was expected to move writing from the computer lab to the classroom where more space was available for all group members to participate. It would also remove typing constraints from the process of reflection, and allow teachers to organize the typing and sending of e-mails according to the computer facilities and time available. Fourth, to invite all children to participate actively in collaborative writing, an individual freewriting exercise [16] was embedded in the lessons right before the groups were to write their e-mail.

4.3 Procedure

A broad range of data was gathered to gain insight in the implementation of narration by the teachers, the children's motives for narration, and the collaborative process and products of reflective written narration. General observations were conducted in the classrooms. In addition, teachers wrote weekly reports, and formal and informal interviews were held with the teachers and some children. In addition, freewritings and e-mails were collected for detailed analysis.

The e-mails were segmented into clauses and coded for their general content (Personal Talk, Communicative Talk, Design task related talk). Design task related segments were further categorized in the five categories of reflective narration that were found in the e-mails of an earlier design experiment (Describing, Questioning, Relating, Appreciating, and Assessing). For detailed coding procedures see [5]. Interrater agreement was calculated for each step. A second independent coder coded about 25% of the data. For segmentation, the interrater agreement was 95.9%. For general coding, Cohen's Kappa yielded .95. For detailed coding, Cohen's Kappa yielded .80.

Next, some results of the design experiment are presented. For a complete overview of findings see [5]. The first perspective (the act of narrating) presents findings on the teachers' implementation of and children's motives towards freewriting. The second perspective (rhetorical statement) presents findings from the e-mails. The third perspective (story) presents findings from the freewritings.

5 Results

5.1 Act of Narrating: Composing E-mails

The teachers used freewriting as planned. They embedded it in all the lessons (with the exception of one lesson in one school due to time limits) shortly after working on the design task. They carefully followed the step by step procedure provided in the lesson plan giving the children three minutes to silently think about the lesson. After that, the children wrote for five minutes. Now and then, the teachers helped individual children that got stuck by suggesting what they could write about. Sometimes, they prompted the children not to think but write in a continuous flow. The teachers evaluated freewriting positively. They reported that it structured the e-mail process.

In general, the children too evaluated freewriting positively. They were able to think and write about the lessons and most of the children were motivated to do so. However, freewriting was not evaluated positively by all children. Two types of negative reactions were given. Some children experienced freewriting as an obligatory exercise that simply had to be done. They didn't feel invited to express personal experiences, but rather to write down a pragmatic recount of the lesson. In addition, for some children freewriting was difficult. Although freewriting seeks to free learners from writing constraints [16], some children found it physically and mentally difficult to engage in a flow of writing.

After freewriting, the groups composed an e-mail. Often, this process started with reading each other's freewritings. Sometimes, the children read each other's writings silently for themselves. Other times, they took turns and read their own freewritings aloud. After reading the freewritings, the children used a worksheet to write an e-mail message. The teachers instructed them to write a reaction to the received e-mail and to compose a group e-mail on the basis of the freewritings. In the process of composing group e-mails, the freewritings played an important role. The children frequently referred to the freewritings while discussing options, chose parts that could be used in the e-mail, and discussed similarities and differences to reach an agreement about what they should write to their partner group.

Although freewriting was successfully implemented in the classrooms, some problems were also noticed in relation to the composing process. First, reading each other's freewritings often happened in a somewhat chaotic and unstructured way. No specific time was reserved for reading and discussing the freewritings. Instead, this was often mixed with writing the e-mail. The teacher in school 1 skipped the composing process after the second lesson. In the months preceding the project, the children in this classroom were trained in word processing. For the teacher, a side aim of using e-mail was to increase the children's independent use of word processors. Therefore, he let the children type their freewritings in a group document. The children did not read and discuss each other's freewritings. They merely sent out their group document to the partner group in an attachment.

5.2 Rhetorical Statement: E-mails

In total, 72 e-mails were sent during six lessons (*M*=6 e-mails per group). Weekly e-mail contact was realized between school 2 and 3. However, the e-mail contact between school 1 and 2 was hampered due to illness of the teacher. In school 1, lessons were rescheduled. As a result, school 2 received no e-mails from school 1 in lessons 3 and 4, and received two in lesson 5.

The e-mails had an average of 148.5 words (*SD*=122.0, *N*=70). This differed between schools. In school 1, the average length of the e-mails was 237.5 (*SD*=99.6, *N*=29). In school 2, the average length was 67.5 (*SD*=17.0, *N*=35). In school 3, the average length was 98.5 (*SD*=29.2, *N*=6). The difference was significant between schools 2 and 3 ($\chi^2(1, 41)=6.0$, $p<.05$), and between schools 1 and 3 ($\chi^2(1, 35)=8.6$, $p<.01$). The latter can probably be ascribed to the fact that in school 1 freewritings were pasted into the e-mail.

The e-mail segments were coded as either Personal Talk (e.g., "Mary's hobby is horse riding"), Communicative Talk (e.g., "We received your e-mail"), and Design Talk (e.g., "We added new animals to our ecosystem") to gain insight in the general rhetorical structure of the e-mails (see Table 1). PT was most present in the beginning and decreased towards the end ($\chi^2(2, 70)=20.8$, $p<.01$), CT was present during the whole communication ($\chi^2(2, 70)=2.8$, n.s), and DT increased across lessons ($\chi^2(2, 70)=13.9$, $p<.01$).

Table 1. Personal, Communicative, and Design Talk in the e-mails across lessons. The values represent percentages of segments (*N*=1599)

Coding	**Lessons**			
	1&2	**3&4**	**5&6**	**Total**
Personal Talk	48.5	8.5	7.3	21.1
Communicative Talk	19.7	21.4	22.1	21.1
Design Talk	31.8	70.1	70.6	57.8

In schools 2 and 3 and in the first two e-mails of school 1, e-mails had a sandwich structure. They started and ended with communicative and personal information, and contained design task related talk in between. Because in school 1 freewritings were literally pasted into the e-mail after the first lesson, a different structure was expected there. This expectation was confirmed. In the e-mails of school 1, a block structure was found. Sometimes, but not always, the e-mail started with a greeting and reaction to the received e-mail. This was followed by blocks of freewritings, headed by the children's names. Often, there was no greeting at the end. Instead, greetings appeared in between the blocks.

Specific rhetorical moves were found in the e-mails: extended greetings, metatags, repetitive structures, enumerations, and spoken language items. The repetitive structures took different forms in the narratives of school 1. They did not consist of repetitive sentences or numberings as was the case in schools 2 and 3, but were constructed around headings, tables, and around chronological structures. The fact

that school 1 used a word processor probably influenced the rhetorical moves found in their e-mails.

As a result of different rhetorical moves, style differences appeared between schools. In the e-mails of schools 2 and 3, a staccato style was found. In these e-mails, descriptions and evaluations were summed up without extensively elaborating on them. In the e-mails of school 1, an anecdotal style was found predominant. Within the blocks, extensive and chronologically related descriptions and evaluations of lessons were given. Other research has also found that different styles and genres can evolve in communities [28].

5.3 Story: Freewritings

The freewritings contained descriptions of the processes and products of designing. Children gave detailed chronological accounts as is illustrated by the following fragments:

> This afternoon we had another kidnet lesson. We talked a little about last week. Next the teacher read the e-mail from Prof. N.A.TURE to the class. It was about Biotopia that there are too many animals and too little food. Then we looked at some e-mails from this week and last week. Then we could do our own ecological community on a large piece of paper. That took us about half an hour and then we had to clean up and finally as usual the five-minute letter last of all. It was a quarter to three and school was over.
>
> (Tim, school 1, freewriting, lesson 4)

> This time we discussed the adder and what it lives on. It feeds on mice so we had to make lots of questions about mice where they live and all that.
>
> (Daan, school 2, freewriting, lesson 4)

The descriptions were enriched by evaluations by relating old and new experiences, and expressing appreciations and assessments of their own behavior. For example:

> I sometimes liked the lesson and sometimes I didn't I think our group is nice we can work together nicely I think fish are quite dull animals. The lesson you had to think up all the things fish need I didn't like so very much I think it's nice to have a fish in our classroom.
>
> (Marion, school 2, freewriting, lesson 1)

> I have learned from this afternoon's lesson something. that we have to discuss in our group and that we have to discuss things in the group and not keep them to ourselves and about fish I didn't know very much yet but a lot more now and I like that.
>
> (Willem, school 1, freewriting, lesson 1)

> A fish in the classroom we liked most of all some didn't listen to the teacher at all most of them were constantly watching the fish for they were anxious to know how it swam and how it breathed most of our class had never yet seen a live fish and that's why they were watching the fish all the time.
> (Dieuwer, school 2, freewriting, lesson 1)

The many personal perspectives that appeared in the individual narrations illustrate that the freewriting exercise helped the children to express an awareness of their own role in learning. It encouraged reflection on one-self and others, and on the process and product of learning.

6 Conclusion

The study presented here illustrates three things. First, it illustrates that more than one perspective is needed to get a full view on the educational value of narration. One perspective is needed to get an overview of the complex setting in which narration has to come about. For instance, children's motivation to write and narrate is not a general one but highly depends on the context in which children are invited to do so [14]. The act of narrating can help to describe which factors lead to succesful implementation and engagement. In our study, the focus was on the implementation and appreciation of freewriting and e-mail as tools for collaborative narration. A second perspective is needed to pay special attention to the kind of narrative that is produced. Studying the rhetorical statement can inform us about the strength and weaknesses of certain tools, and can explain ways in which children perceive the act of narration. In our study, for instance, looking at the rhetorical moves in freewritings and e-mails revealed children's audience awareness, and hence if they perceived narration as essentially monological or dialogical. A third perspective is needed, finally, to estimate the educational value of the narrative process that went on. In our study, the focus was on the reflective value of children's writings.

Second, it illustrates that narration can personalize the learning process. The freewritings and e-mails frequently described children's personal evaluations and appreciations of lessons and products, as well as personal assessments of their own and other children's behavior. The reflections that the children produced had a strongly personal character in which their own appreciations of things, and past experiences from outside school were interwoven with new learning content. As such, narration fits the idea of constructivist learning approaches that emphasize the active role learners play in their own development by acknowledging the prior knowledge they bring with them when they enter a learning situation. The research presented in this paper helps to show that if collaborative, self-regulated constructivist learning is to become successful in primary school curricula, then opportunities for narration can be of great value.

Third, the study illustrates that design-based research is a fruitful approach to gain insight in narrative learning. Because doing research within a complex and real setting is one of its principles, it fits the multiple perspective view on narration that was

presented. From each perspective, data can be gathered and analyzed to shed light on different aspects of a narrative learning environment emphasizing both the process and product of such learning. The design experiment that was presented here was part of a chain of design experiments. Based on findings in the preceding experiment, freewriting was introduced in the lessons. Based on the findings in the design experiment that was presented here, a next experiment could be conducted that paid more attention to the composing process. Finally, in design-based research the development of theoretical issues and practical outcomes are both deemed valuable. Since the development and implementation of narrative learning environments is still in its infancy, design-based research can provide us with a framework to work on both matters at the same time.

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The Role of a Video Editing Application in Eliciting Children's Narrative Perception and Creativity

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Abstract. This paper reports pilot work in the form an exploratory case study conducted by two re-searchers with children aged from 10-13, into specific aspects of narrative. The functionalities of a video creation and editing application, in combination with researchers' input to the pro-gram are used to elicit children's narrative perception and trigger a creative process. During this activity children adopt invented techniques in order to record and produce their own videos, as reproductions of a well known fairy tale. The process, as well as the products is examined in terms of their relation to specific aspects of narrative. The process is considered as a chance for children to shape their own authentic hermeneutic stances on the story. The videos are seen as textual constructions employing different media modalities such as written text, verbal elements (voice narration) and dialogic elements in written form (dialogue bubbles). Preliminary data are reported to inform further exploration.

1 Theoretical Framework

1.1 The role of iconistic representation in story telling

Narrative is a complex activity that helps us create links between the ordinary and the exceptional [3], or set dilemmas and find solutions [22]. By framing mental representations of facts and behaviours, people reconstruct the surrounding world and try to understand it. At the same time, they build cognitive paths in order to memorize things and recall them when needed, since information when organized in a narrative form is easier to be memorized and recalled [18]. Children like hearing stories, because they give them keys to face and explain a constant flow of events, read other persons' minds and get aware of cultural patterns. As creators of a plot, no matter if it is a fantastic or a real story, children understand that they have to organize their intentions, so that they can be understood by the listener or reader. Organizing and understanding a fantastic story means that both the child-narrator and the child-interpreter grasp a narrative sequence and use it as an explanatory frame for representing happenings, behaviours and mental states according to their schemes. If this is the case, then how does this transfer of conceptions and explanations from an imaginary world to the real world take place?

Mieke Bal's Narratology [2] introduced the idea of narrativity as a relation between an external object and the internal representation that this object can raise in a person's mind. Pictures, for instance, could be considered narratives as they can evoke a narrative in a viewer. Peter Abbott [1] claims that some pictures produce a "narrative perception" effect, which means a natural tendency to associate a narrative time to a static scene. In order to explore this effect, we have chosen an illustration of the famous short story of Oscar Wilde, "The Selfish Giant". The selected pictorial drawings implicitly weave a relationship between real and imaginary and the representation of a scene to scene action creates time leaps and fosters creativity. A random sequence of events/pictures cannot be accepted as a story, and therefore children have to create a plot, that provides an explanation of events from their point of view. The educational aim is not the "reproduction" of O. Wilde's story (Figure 1).

Fig. 1. Selected pictures from "The Selfish Giant"

It's rather a creative writing process by embodiment of real world feelings and causal relations in a fairy-tale coherence. By this embodiment we complete a circle of creative imagination from real world to imaginary and back to reality. A legend is attached to each illustration as a minimal description, to prevent troubling abstraction. The story has been told to children, but any hermeneutic attempt has been purposefully avoided, as the aim is to provide them only with a basic plot and give them the chance to shape their own understanding and develop their own hermeneutic stances, according to non-predefined criteria.

1.2 The role of video editing technology

The technological tool used is Camtasia Studio, a video creation and editing application which has three main functionalities:

- a media "library", for importing media files (sound clips, still images and video files),

- a "story board view", for sequencing still and moving images as the "scenes" of the video, adding transitions, comment boxes and dialogue bubbles,
- a "timeline" view, for synchronizing audio files to images. The application also allows for voice narration to be recorded and inserted as an audio clip and for recording everything the user does on screen and saving it to a separate video file.

The initial scenario of the software use was the following: children are introduced to these features, and are presented with a library containing the pictorial illustrations shown in Figure 1, each illustration attaching a very brief descriptive legend and some default music files. They are then asked to arrange them in a coherent sequence, "so that it makes sense". They are then asked to choose if they will use the voice narration feature or the call outs and bubble dialogue tools to add narrative content to their video. In case they decide to narrate the story themselves –which was the case in the second group-, voice narrations are recorded and saved as separate sound files, also available in the library.

A first hypothesis was that, although children are inclined to use the powerful tool of language –and body language- to narrate or role-play their stories, they envisage the tension between this natural tendency and the affordances[10] of the physical artefact at their disposal, as the aim of the story telling activity is to present the story in the particular form of representation, integrating multiple sources of media material. In the process of this tension (as termed by Wertsch [25]), they engage in a procedure of "instrumental genesis" [12]. The latter presupposes a clear distinction between the technological artefact (video editing application) and the instrument that a human being is able to build out of this artefact (the video representing the story) and is a complex process that goes through user' s activity worked out at a given context. The tools students are expected to create constitute different "instrumental orchestrations" (specific arrangements of the artefactual environment, ibid.) and it is possible that these could surprise even the designers of the software, and are of particular interest to the activity designers. One of the reasons we consider this design as "allowing for instrumental genesis" [16] is that story structure is not given to the students in advance. They have to construct connections between visual (static pictures) and verbal (legends) elements, and combine these "default" elements with their own input (sound files, their own narrations and text, either in narrative or in dialogical form), to compose a dynamic representation in the form of a video file.

1.3 Research foci and questions

According to the New London Group (1996) "Learning and productivity are the results of the designs (the structures) of complex systems of people, environments, technology, beliefs and texts". In this model, learning occurs through interaction with "available designs". Designing, in this sense, is a process of emergent meaning-making, of transforming available designs through their re-presentation and re-

[10] in the sense given to the term by Gibson [11], according to which, affordances are described as the complimentarity between individuals and the potential usability of physical objects as the "affordances" of the object or tool and the individual in a specific context.

contextualization, re-using old resources and, learning is based around a continuous process of "appropriation" of resources from former designs and their re-articulation for new purposes (ibid.).

Williamson et al [26] refer to "available designs" as "including the modalities of semiotic systems such as TV, photography of physical gesture, and the conventions associated with semiotic activity in a given social space. In other words, available designs are both grammars of varied media, or semiotic systems, as well as "a socially produced array of discourses, intermeshing and dynamically interacting".

Bearing in mind the above theoretical considerations, our research focus was to explore the way children appropriate their initial provision of resources. In other words, how they use an "instrument" (the video editing application) to construct different "tools" (their own videos) and how they sketch their own design according to all available designs they are acquainted with.

During this process, children were expected to:

- negotiate spatial, temporal and logical patterns, engaging in a form of "dialogic inquiry" [13] [23] [24] or, as termed by Mercer [19], "processes of exploratory dialogue".

- adopt "roles" of stagecraft, such as that of "producer", "designer", "actor" and approach storytelling with an "ad hoc ethic" [26], as they inter-change among these roles, assigned to them not by the teacher, but by their group' s social dynamics.

- shape an understanding on how many different representational modes interact dynamically in the creation of meanings and understandings

- Be engaged in a demanding situation, where they are almost "forced" to recreate the various discourses of the media they are provided with (sound, pictures and text). This may lead take the form of mediating, mimicking, or parodying typical discoursal forms (ibid.)

Our axes for forming the research questions are based on Conle's [7] framework. Conle uses Gennette's [10] seminal analysis to clarify the use of narratives in both teaching and research. She identifies three perspectives ("facets") of narratives, each affording different views:

1. rhetorical moves that create a particular "narrative" or "narrative statement":

   "the oral or written discourse that undertakes to tell of an event or a series of events. It becomes available for textual analysis and, as a product, it is marked by teachers or gets published in research[11]".

2. events and situations that are being described, that is, the "story" that is being told, given that the same events can be told in different ways

   "the succession of events that are the subject of the discourse or statement, story is the totality of actions and situations, taken in themselves, without regard to the medium, linguistic or other, through which knowledge of the totality comes to us".

[11] The quotes in italics are from the initial writings of Genette [10].

3. the actual "telling", without which there would be no statement, and perhaps not even a story to tell

   "the act of narrating, the act of telling (or perhaps, writing of filming). It includes the situation in which such acts take place".

The questions arising under this lens are the following:

- with regards to the "narrative statement": what form of discourse the pupils employ to add content to their videos?

Their potential choices are dialogue bubbles (call outs) –which imply a dialogical character for the story-, comment boxes –which point to a narrative commentary and voice narration –which certainly focus more on oral elements. All choices, as well as a combination of more than one, which is also possible allow the analysis of pupils' products as multimodal texts[12]. For the specific case of the bubble dialogue choice, McMahon et al. state that "The Bubble dialogue tool acts as a bridge from conversation to text. It exploits the competence in oracy, the natural language of children, and moves them, easily and imperceptibly into the exploration of different aspects of language" [17, p. 9]. This, in our view, reflects the notion that writing dialogue for characters with the help of a conversational respondent can help children adapt strategies from spoken language for use on written language and is an issue for further exploration.

- with regards to the "story" being told (the events and situations being described): how is the initial story structure altered –if so- and what are the modifications on the event sequence.

Our design doesn't include a lesson preceding the activity, providing the chance to the children to create their own hermeneutic stances, in a "primitive form of literary criticism". More specifically, the reconstruction of the story is seen as a pure effort of creating an understanding from a simple plot, not analyzed in advance.

- with regards to the "actual telling"(or writing or filming): how do children organize their actions as "directors", that is what roles they adopt, and what norms and types of social orchestration are being encouraged in such an activity.

[12] In the sense given to the term by Morgan [21], according to which, "Text is considered in its broadest sense, including both oral and written, and both visual and verbal, as a term to denote any socially coherent piece of language-in-use where language may include or be substituted by other semiotic systems. Thus a text can be written or spoken, formal or informal, long or short, produced monologically by a single writer or dialogically by several in interaction.

2 Methodology

An influential idea informing our methodology is that of "design" in learning .[4][9][13][15] an emergent paradigm for the study of teaching and learning processes in authentic and contextualized environments, integrating the use of technology [6]. According to this framework, good design should lead to a system which is stable enough, to serve initial design and flexible enough, to correct and expand it [14]. A crosscutting feature of this methodology is its highly interventionist nature, as it aims at deliberately engineering specific learning situations –differing from traditional ones- in order to study them and has been characterised as "a test bed for innovation" [4]. These educational interventions are viewed holistically, as "enacted through the interactions between materials, teachers and learners" [9] They often entail the use of new resources, such as software applications and commit in promoting under-standing the relationships among theory, designed artefacts and practice [9].

We consider our research to bear the above characteristics. However, having in mind that design research is rather an informing rationale than a specific research technique and thus relies on techniques from other paradigms, and since the data we needed to collect were of a qualitative nature, we have employed the case study approach. The latter is recommended by [8] if the problem to be studied "relates to developing an in-depth understanding of a "case" or "bounded system" (p. 496) and if the purpose is to understand "an event, activity, process, or one or more individuals" (p. 496). Our purpose was to gain an insight into a particular learning situation. The situation or "case" was "bounded"-in other words, spatial and temporal limits can be drawn around the object to be studied [20]-, and this strategy was considered mostly appropriate. The case study was of an exploratory nature [5], in order a) to shape a first picture of children's' interaction with the software, and focus on possible technical difficulties or problems encountered, b) to identify the kinds of products or "tools" that are likely to be constructed and c) to further refine the research questions.

The data collected were of three types: a) observation notes, organised in pre-sketched protocols. These were cross connected to video recordings of the sessions b) interview transcripts and c) pupils' products, in the form of video (*avi) files. Pupils' actions on screen were also recorded by a facility supported by the program.

Two pairs of pupils (age 10-12) were observed by the two researchers accordingly, using the same observation protocols. Their categories focused on a) pupils' comments on the use of specific software features, b) pupils' discussion informing decisions on their form of "input" to the library (that is, a basic design decision between call outs/comment boxes and voice narration, or the employment of both). The two groups were observed for eight hours (four two-hour sessions), the first hour being an introduction to the software features and the second and third, a preparation of the media resources in the library.

The researchers' role was as unobtrusive as possible, given that not all pupils had the same experience with the use of computers and video editing applications in particular. However, there were incidents where intervention was considered necessary, for helping children on features of the software they didn't feel confident with, or recording their voice narrations. Another task carried out at the beginning was the narration of the story, which, as stated in section 1.1, was restricted to informing them of the basic story plot and avoiding any hermeneutic comments.

During the implementation, we used Camtasia Studio's recording facility to record pupils' actions on screen. These data were then triangulated with the data we gathered from two evaluative semi-structured interviews conducted at the end of each experience.

The two pairs under investigation were not homogenous in terms of age and experience with computers. Specifically, pair A consisted of a 10 and an 11-year-old pupil and pair B of an 11 and a 13-year-old. The sampling was not purposeful and there were specific time limits on the activity, as stated in section 2. Because of these dissimilarities, we employed the use of "vignettes" in narrative form, for portraying key issues that emerged during critical incidents of the experience, and their relation to our research questions.

3 Discussion

The narrative products constructed by children were different, both in terms of form and in terms of structure. Group A was characterized in vignette 1 as "tellers". They focused solely on the resources we had provided them with and decided to narrate the story using comment boxes. Voice narration, as well as sound input or dialogue bubbles were considered unnecessary, as shown in the interview extract below:

Researcher: How about adding bubbles, or your own voice?
Student 1: No, no.
Student 2: They are like comics. This is a fairy tail
Student 1 [mimicking the Giant's words]: "oh, I' m so lonely'
[both laughing]
Student 2: It's funny, a Giant doesn't talk like this

Their video is therefore a combination of the given static images and their written narration in third person. Their main negotiation related to the expressions they were going to include in their narrative, so they mostly focused on its "stylistic" aspect. Homogeneity in expressive means seamed to be a serious consideration, while other modalities apart from written text were

This "denial" of other forms of text isn't necessarily an informed choice, as it may be due to their inexperience with video editing, or the illustrations' abstract character. In either case, the software functionalities didn't evoke them the need to "tell and show", as did the other pair. There was also a dedication to the use of "standard" fairy tail expressions, such as "Once upon a time" and "At the end". In two instances of the story, where there was not enough space on the illustration to include all their content, they proposed inserting "empty scenes", meaning just text.

Pair B were the "directors", in vignette 2, due to their tendency to "show" as well as "tell". They followed a different strategy, employing almost everything medium available by the program. They decided to add voice narration, and combine it with dialogic scenes. When asked how this was going to be done, they said "as we go along, whenever it fits". What was a surprise to the researchers was a critical incident

indicating a purposeful intervention, which we hadn't considered when designing the activity.

> *Student 1: Why don't we play it?*
> *Researcher: How do you mean this?*
> *Student 1: Why don't you record us with the camera? We'll be the children.*
> *Student 2: Yes*
> *Researcher: You mean, you want to use your own pictures, not these here? [pointing to the illustrations on screen]*
> *Student 1: No, these are fine, but, when we show this video, they have to understand what happened in between.*
> *Student 2: [pointing to the person filming the session] he's going to be the Giant. Do you have a suitcase? Because he is returning from a long trip.*

Before this dialogue, the children had arranged all the pictures in the gallery and had inserted their first voice input. When presented with the problem of deciding which media form would be most suitable for the story to continue, they came up with the idea of role playing the story themselves. What came out of this was a video containing extracts from their role play, inserted between each illustration. The production was also enhanced by call outs and voice narrative, as there was no "script" for the role play and they just mimicked "mute" scenes.

With regards to the second research question –the story structure-, children in both pairs followed the initial plot, arranging the pictures in almost the same sequence. However, the fact that they had to choose the form of representing their content is by itself a hermeneutic action, bearing in mind that there was no previous analysis by a teacher or researcher, and the children only knew the basic plot. Their input is considered a form of "primitive" literary analysis, as it constitutes a reconstruction of the story and not an exercise with specified outcomes. This is an issue of further exploration, along with the third research question, referring to the roles adopted, and the social norms and types of orchestrations adopted.

To further investigate the above, we propose the extension of the exploratory study to a "cross case study" or "multiple cases", as termed by Merriam [20] and Yin [27]. With multiple case studies, data are analyzed for insights both within each case and across cases [20]. Yin [27] proposes this strategy if one wishes to replicate insights having been shaped within individuals cases or to represent contrasting situations and considers it as "more compelling", adding robustness to the main study. Two cases that we consider as possible are the use of the software in an authentic classroom setting, with pupils working in groups of four persons maximum, and the involvement of a teacher, along with the two researchers. In contrast to the implementation of the activity in the exploratory phase, which constitutes a separate case, the classroom implementation would further illuminate the question related to the social aspects of pupils' interaction. The role of the teacher should be that of the "plot informer" – instead of "story teller", as this task is given to the students- and the degree of researchers' participation will be redefined, as this first pilot experience is further analysed and elaborated.

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Using Perspective in Narrative Learning Environments

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Abstract. Several empathic applications have been developed over the last years but can we redirect that empathy to specific characters? This paper focuses on the intention to induce empathy in children and stimulate role taking by presenting a narrative through the perspective of a specific character. The use of perspective is achieved by showing the events that happen in the story but without impartiality.

We will describe a narrative-based application designed to help children cope with bullying situations, the FearNot! demonstrator, and an embedded filter that provides the subjective point of view of its characters, by observing the personalities and the relationships between those characters.

1 Introduction

The aim of this paper is to develop a way of influencing the emotional reactions of users of a virtual storytelling environment through the use of "perspective". To study that, we have to contextualise our approach and, therefore, we have applied it within the *FearNot!* application, which is a learning environment used to help children become aware of how to deal with bullying problems in schools.

If we want to increase or influence the empathy felt by the child (user) towards characters in a simulated 3D emergent story, s/he must not feel as an outside observer but, instead, as if taking a role in the narrative. In other words, in order to establish an empathic relation, the child must identify herself with a particular character. For such "role taking" to happen, the perspective that is "absorbed" by the user is quite important. In fact, we all have a need to know different perspectives of a story, whether to understand it as a whole, by gathering different information, or simply because we trust one's version better than someone else's. This is what motivates authors to create *Multiform* or *metalinear stories*, which are narratives that provide the participant with multiple perspectives or different versions of one single plot.

In a story we can identify two important levels, which equally contribute to its success and complement each other: the *narrative level* and the *narration level*, [3]. The *narrative level* corresponds to the events and to what happens in the story. The *narration level* corresponds to the way the events are presented, to the way the story is told (or shown), [10].

Since narration is defined as the way the plot is presented, [10], it depends on who tells the story and on how it is presented. This happens because the person who tells it has perceived the story in a personal way, which implies that when we observe, for example, the reactions of a character through the perspective of a person *A* we will experience the narrative differently than through the perspective of a person *B*.

In conclusion, events in a story can be "seen" differently if they are seen through the eyes of different characters. Based on this, we have built a specific system for presenting a character-based perspective, which will allow the child to experience a different narration according to the character that is *telling* the story.

The solution, here proposed, to introduce perspective without changing the actions of the characters aims at influencing the notion of intentionality. This choice was based on the fact that our perceptions are associated with our feelings of empathy and, according to some authors, empathy derives from intentions.

Jean Decety, [4], has studied empathy through the observation of the process of imitation and has found that "when observing someone's action, the underlying intention is equally or perhaps more important than the surface behaviour itself". His statement is in accordance with what had been studied and suggested by Meltzoff, [11], and Baldwin, [2]. Both authors claim that when we observe others we "look" at their intentions and use that information in our responses.

So, in this paper we will present a system for perspective creation in a virtual storytelling environment.

This paper is organised as follows: we will begin by explaining the bullying problem, in order to contextualise the *Victec* project, and then describe the *FearNot!* application, developed within the same project. Afterwards, we will present our approach to introduce perspective and describe the *Perspective Filter* and its implementation within *FearNot!*. Finally, we will provide orientation for future work.

2 A Brief Description of Victec and the *FearNot!* Demonstrator

The main goal of the *Victec* (*Virtual Information and Communication Technology with Empathic Characters*) project[13] is the prevention of a specific form of aggressive behaviour, that is, bullying situations. Bullying behaviour can be described as an intentional and repeated aggression (not necessarily physical) where there is an imbalance of power, [12]. This behaviour can be divided into two different forms of aggression:

Direct Bullying – also referred to as *physical bullying*, it includes, for example, actions such as hitting, kicking, threatening or taking belongings, [7];

Relational Bullying – this type of bullying is expressed through social behaviours such as social exclusion, malicious rumour spreading, and the withdrawal of friendships, [16].

[13] All the information related to the *Victec* Project can be found at the official website of *Victec*, http://www.victec.org.

Bullying represents a global problem, as it has been identified in several countries. It occurs mostly among children in schools, namely in the playground or in the classroom. The decrease of these aggressive situations is a priority in our society. So far, antibullying initiatives have not been very efficient. The *Victec* project introduced a new approach to the problem, as it is based on the use of a virtual learning environment where self-animating empathic characters simulate bullying situations using emergent narrative. The result was a software program designed to help reduce aggressive behaviour of children between the ages of 8 and 12, [14]: the *FearNot!* demonstrator. *FearNot!*, which stands for *Fun with Empathic Agents to Reach Novel Outcomes in Teaching*, is an interactive application embedded in a virtual environment that uses synthetic cartoon-like characters.

In *FearNot!* the emergent narrative is accomplished through the use of intelligent synthetic characters, implemented with an emotional model and a social memory.

In the context of *FearNot!*, an empathic relation is precisely induced between a child and the synthetic characters. In order to achieve that, the characters play a bullying situation, placing the child as an observer, [13].

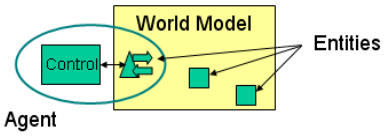

Fig. 1. The FearNot! Architecture

The aim of this application is to induce affective responses in children during bullying situations, and thus "change their behaviour and cognitions", [14]. *FearNot!* allows an evaluation of the believability of the characters as well as of whether children will develop empathic relations with those characters.

This program creates an episodic narrative, as it generates a sequence of small episodes. The narratives are generated either in the context of direct or relational bullying situations that take place in a school. At the end of each episode, children will interact with the characters and give advice. These pieces of advice will influence the following episodes.

2.1 The Architecture

FearNot! was implemented with an agent-based architecture (see Figure 1). This application was built using autonomous agents that decide, as the narrative unfolds, their behaviour and contribution to the narrative itself. At the implementation level this translates into changes that affect the *world model*.

The agents in *FearNot!* have an emotional behavioural model and act in the world according to it (see [8]). Their actions are a consequence of their perceptions of the world, which are a result of interacting with each other or with the child.

This unscripted narrative environment represents a challenge to the creation of character-based perspective as it is impossible to pre-determine the course of the narrative and the actions of each agent.

So, in order to "shape" events that are created by autonomous agents, we propose to generate parameters to model the emergent narrative as the agents produce their behaviour.

2.2 Providing Perspectives

The approach here presented, in order to create perspective-oriented narrative, consists of influencing the perception of intentionality in a virtual storytelling environment. To achieve that, we aim at "shaping" the intensity of what is seen so as to influence the visualisation, and thus the perception, of the bullying episodes. This suggestion to provide perspective should be accomplished as the characters in the story decide to perform an action, but without directly affecting or altering the action performed.

To achieve this goal we propose to adapt the intensity of the actions performed by the characters to the appropriate perspective as well as to emphasise those results through the use of a camera. We have created a filtering module so that when it receives the instructions regarding the actions that will be performed, it will filter that information and generate the appropriate instructions to the *world model*. This filtering is applied to the information that is shared by the *control* and the *world* modules (see Figure 2).

The module that we present to create perspective will analyse some of the personality aspects of the characters, the relationships they had with one another and the actions they performed, thus providing the adequate narration of the events.

We do not intend to show accuracy between the intensity of the action and the personality of the character performing the action. Every action is, therefore, filtered in order to make prevail the perception of the "owner" of the perspective or even his distortion of the truth.

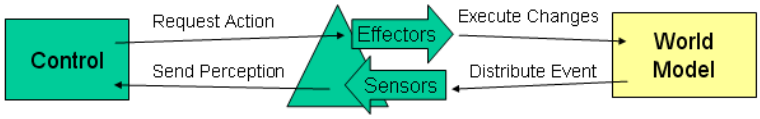

Fig. 2. The control module interacts with the world module by, cyclicly, receiving perceptions and returning actions that have effect on the world

All of the choices that were made during the development of this work were based on the Disney principle of exaggeration, [9]. This "ideology" was followed in order to create more impact on the child, rather than trying to achieve realism or simulate real behaviour.

3.1 *The* Perspective Filter

The *Perspective Filter* is the module that interprets every action and "shapes" the way it is displayed during the narrative experience (see [15]). This filter provides a structure that is independent of the narrative itself and the characters who participate in it, since it extracts all the relevant information about those characters from their *functional roles*. In

other words, this module is based on the stereotyping of the role of the characters, through their personality traits.

For example, when we choose to see an episode according to the perspective of a character A, and whenever an action is performed by a character B, different parameters will vary according to the relationship between the two characters and according to one or two personality traits of character B.

So far, the parameters that influence the way the action is displayed are: the type of camera shots and the intensity of the action (consider, for example, that when an aggressor pushes a victim we can observe a slight push, from his perspective, or a violent one, from the perspective of his victim).

The way the *Perspective Filter* works is sketched in Figure 3.

3.1.1 Perspective Types

The relationships we build with others influence the way we interpret events as well as our views on them, so it was mandatory to include this influence in our creation of perspective in storytelling.

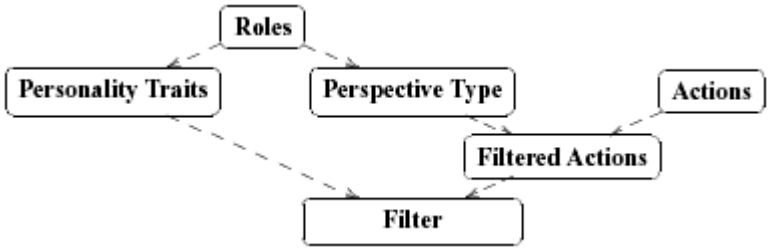

Fig. 3. Inputs of the Perspective Filter

The best way to include the information provided by interpersonal relationships in our module was to create different types of perspective. Therefore, we have considered three main types of perspective: a *self-perspective*, a *friendly perspective* and an *unfriendly perspective*. These different types are based on the relationship between the "owner" of the perspective, or *focalizor*[14], and the character who performs the action. The *self-perspective* will obviously occur whenever the character whose perspective we are following performs an action. The *friendly perspective* is shown whenever the focalizor feels empathy for the character who is conducting the action. Finally, we observe an *unfriendly perspective* if the action to be viewed is executed by a character who does not provoke empathy in the focalizor.

The purpose of these different types of perspective is to enhance the negative actions, and to give less importance to the positive or neutral actions, of "enemies" and to

[14] The term *focalization* was introduced by Mieke Bal, [1], to represent "the relation between the vision and that which is 'seen', perceived". Edward Branigan, [3], defines the *narrator* as the provider of statements and the *focalizor* as the provider of his own experience.

do the opposite regarding the actions conducted by friends (or the focalizor's own actions).

The combination of the three types of perspective, based on who is performing the actions, is what provides the subjectivity of the focalizor in the experience.

3.1.2 Character Roles and Personality Traits

The roles play an important part in the decision concerning how to filter the narrative. Most narratives include a structure which allows stereotyping the characters in predefined roles, such as the hero and the villain. So, using roles is advantageous given that they can be used with every narrative, and not just in the case of bullying scenarios.

The use of roles has enabled the definition of relationships between groups of characters and, therefore, the creation of a structure which is independent of the narrative itself. Since each character is always attached to a role, the personality traits of each character are induced by the personality traits defined for his role.

The personality traits defined were the following: Aggression, Hot-temper, Self-esteem, Shyness and Anxiety.

These traits were thought to be appropriate to influence how an action is shown, especially in a context where they represent the most noticeable features in the roles. For instance, regarding the bullying scenario, these personality parameters were the ones that stood out the most when defining the profile of personalities involved in bullying.

Aggression – this trait is very useful to show intentionality when modelling the bullying scenario;

Hot-temper – this characteristic is usually associated with aggression and is used in certain actions that can be seen as impulsive;

Self-esteem – certain actions such as "crying" are commonly associated with self-esteem. This statement does not necessarily mean that those actions are triggered by the level of self-esteem, simply that we often look at them as the behaviour of a person with low or high self-esteem;

Shyness – we regard certain actions as "bold" attitudes for a shy person, therefore shyness represents a strong parameter to influence the emphasis in the actions;

Anxiety – this trait is associated with actions that are viewed as the behaviour of "nervous people".

For each action, one or two personality traits are taken into account. In order to "exaggerate" the results, and thus create more impact when generating the perspectives, each trait can only assume one of these three values: **high**, **normal** or **low**. As a result of this constraint, we expect to achieve more contrasts between different perspectives.

We are aware of the fact that these five personality parameters are not theoretically sustained as a complete personality model, in opposition to the Five-Factor Model proposed by Costa & McCrae [6], for example. Nevertheless, if we had used the Five-Factor Model of *Extraversion*, *Agreeableness*, *Conscientiousness*, *Neuroticism* and *Openness*, as our personality model, we would have had serious difficulties in determining which traits would influence each of the usual actions available to characters in a narrative.

Therefore, and since we do not want to generate behaviour with our perspective module, instead of considering a (complete) personality model, we just considered some personality traits. This choice was much simpler than the Five-Factor Model, but powerful enough to differentiate the personality of each character present in normal narrative stories.

3.1.3 Perspective Parameters

To provide the perspective of a character during the emergence of a narrative, this work has combined the values of two parameters. The two parameters considered were the following:

- Camera Information – indicating the shot, angle and target framed during the action;
- Action Intensity – the action is shown with more or less intensity, revealing intentionality or the lack of it.

The camera is what allows us to "witness" the story. Some shots can put us in a character's shoes while others can move us away from the story, transforming it into something that produces no empathy and even dissolving any sort of interest we might have in the narrative being told.

Thus, the shots might provide us with either intimacy or indifference towards the events. For example, if we observe from a distance, we will feel more indifferent than if we watch a character in a close-up, as we are given the impression of being inside the story, feeling immersed. Hence the importance of the camera shot to this project.

The power of the shot is taken into account by several researchers, who understand it cinematographical importance to influence the perception of the viewer. For example, the *Mimesis* architecture, [17], includes a *discourse planner* which determines the appropriate camera shots according to the actions performed by the characters.

Furthermore, we also want to induce the notion of perspective through the level of intensity used in the animations. The intensity of an action directly influences the perception we have of the action itself.

Our aim is to manipulate the animations in order to simulate a degree of intentionality, thus originating different perceptions when using different focalizors. For example, when considering the bullying scenario, from the bully's perspective, he will not perform negative actions intentionally as he will not want to emphasise his "bad behaviour", so these actions will be viewed with little intensity. But from the victim's perspective, the bully's aggressive actions were completely intentional, therefore, they will be shown with great intensity.

3.2 Implementing Perspective in *FearNot!*

Within the scope of the *Victec* project, we have implemented the *Perspective Filter* described above in the *FearNot!* demonstrator. We will now see the character roles and actions that appear in this application and how personality traits were associated with them.

Table 1. Personality Traits of the Characters of *Victec*

	Bully	Victim	Bully\Victim	Assistant	Defender	Outsider
Aggression	High	Low	High	High	Low	Normal
Hot-temper	Normal	Low	High	Normal	Low	Normal
Self-esteem	High	Low	Low	Normal	Normal	Normal
Shyness	Low	High	Low	Low	Normal	Normal
Anxiety	Low	High	High	Low	Normal	Normal

3.2.1 Roles in Victec

As we have seen before, the *Victec* project is embedded in the bullying scenario, which usually involves six typical roles. Here is the description of each role, as provided in the official site of *Victec*:

- Bully: bully others only and are not victimised;
- Bully/Victim: bully others and are victimised at times;
- Victim: victimised but do not bully others;
- Defender: defend and help the victim when they are bullied;
- Outsider: do not defend or help the victim or assist with the bully. Neutral but may be an onlooker to the incident;
- Assistant: helps the bully in bullying incidents.

The personality traits considered for the *Victec* characters are presented in Table 1. The values of the personality traits are sustained by the information given by the stereotyping of the roles included in a bullying scenario.

3.2.2 Actions in Victec

We have considered one or two personality traits, as mentioned above, in order to change the way an action is displayed. These choices were made according to the traits of personality that we usually associate with certain actions or the way we perform them. For instance, we associate Aggression and Anxiety with the action Drop.

Here is the list of all actions included in this work, so far. They are grouped by their valence and associated with the personality traits that influenced their visualisation.

Negative (or non-prestigious) Actions:

- Cry – Anxiety, Self-esteem;
- Drop – Aggression, Anxiety;
- Kick – Aggression, Hot-temper;
- Mock – Aggression, Shyness;
- Punch – Aggression, Hot-temper;
- Push – Aggression, Hot-temper;

Neutral Actions:

- MoveTo – Self-esteem, Shyness;
- Pick – Aggression;

In conclusion, we implemented the Perspective Filter in *FearNot!* by using the specific roles (and respective personality traits) and actions mentioned above.

As for the camera shots, we are planning to create a set of fixed-shot cameras for each character. This means that when the perspective filter orders a change of shot, the active camera will be switched, instead of being moved. The concept of placing a set of cameras to film the same event has been described in [5], although in this case the different cameras also provided the same shot but using different angles.

4 Conclusions and Future Work

The *Victec* project aims at reducing aggressive behaviour in children within schools by inducing empathy. In this paper we have proposed to induce role taking by filtering a narrative through the perspective of a character. By inducing "role taking", we do not aim at promoting bullying behaviour when providing the perspective of the bully, but to allow the comparison between his perspective and the one from the victim and to provide a means of reflection.

This filter is being implemented within the *FearNot!* demonstrator but, for the time being, the camera module has not been implemented yet and, thus, it has not been possible to test the results of our methodology.

If proved to be a successful proposal to increase empathy, the perspective filter could also include new parameters, such as the sound. For example, listening to heartbeats will induce panic or anxiety and using strong and aggressive tunes will emphasise angry actions (whereas a cheerful background tune will "lighten" the perspective).

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oTTomer: Immersion, Adventure, Interactivity and Innovative Learning. A spatial system for children

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Abstract. Pioneering technologies emerged over the past decades, changing the way we communicate and interact with stories and storytellers. New forms of storytelling arrived, using technology and interactivity where transparent interfaces promote easy interaction, enriching the user interactive experience. This paper describes an interactive adventure, based on users' location, distributed in space and story's timeline where children enter a magic world that invites them to immerse in an adventure full of several learning moments, previously scheduled.

oTTomer is an interactive story for young children (6 to 12 years old) presenting an episode of life in a far away planet, where small creatures face danger, confronting awful beings called Odoracs. The action takes place in a large interaction space with 80 ms (96sq yards) where users interact with virtual agents, interactive scenarios, learning objects and, of course, with the plot itself – that happens in real-time. Children become actors in this adventure, changing the plot as they walk through the space.

1 Introduction

Storytelling has an important role in today's society, as an alternative to mass media culture sustained by television and Internet. Our stories assume different forms like plays, movies, novels or myths; nowadays' challenge is to tell them through new emerging formats and interfaces, in an engaging and pleasant way.

Our communication systems allow the diffusion of stories using many elements like audio, video, animation graphics and text; we need new stories and story models that take advantage of emerging technologies like augmented reality, location-based systems, interactive installations and learning interactive tools. Digital storytelling has been increasing its choices, from digital narratives to innovative interfaces, sound data mining systems and narrative learning environments.

In this paper, we'll present projects that take in account some of these ingredients contributing in some way to the evolution of digital storytelling. After presenting four projects, we'll introduce oTTomer.

2 Related Work

There's a great variety of applications regarding interactive storytelling systems. We will have a closer look at four interactive systems for children, in some ways are close to our project.

2.1 Kidsroom

KidsRoom is an interactive room for children, with narrative playgrounds where children from 6 to 12 years can actively walk, run, and move through a physical space. Build at MIT Media Lab, KidsRoom includes sounds, images and narration techniques, allowing children to interact with each other.

The action occurs in a simulated children bedroom, transformed into a fantasy world land during children's interaction process with the story. This storytelling system is supposed to keep the focus of user action and interaction in the physical space, allowing a multiple collaborating engagement between users. During the story, young users interact with objects in the room, with each other and also with virtual characters projected on the room.

This adventure enables different ways of story interaction, all based on recognition technologies: action (monster's dance), object tracking (locating children) and event detection (identifying children's actions). To grant the narrative control, there are sensor programs to check what is happening in the room at a given time, changing room responses to children's location or actions, granting this way an efficient guidance through the narrative.

2.2 Pets

PETS, Personal Electronic Teller of Stories, is a system which involves children in a robotic pet building process, developed at Human-Computer Interaction Lab, in the University of Maryland – the first version of PETS was developed in 1998.

In PETS, children create a robotic animal with different elements like wings, horns or paws that will allow them to tell stories with accompanying software. Once the robotic pet is created, children can share stories with it, using My PETS software.

This innovative robot can assume several roles, from the storyteller to a mimic robot (miming children's movements), or even a robot that can stimulate children with physical disabilities.

2.3 Sam

«Sam is a virtual child whom children (ages 4-7) interact with by telling stories and playing with real toys (Ryokai, Vaucelle et al., 2003)». This system has two essential components: a 3D child, Sam, projected on a screen and a little toy house with small wooden elements. Sam tells stories but also enjoys to ear them, reacting to children's stories with simple comments. Child and Sam can pass each other the wooden elements, passing them between real and virtual worlds - by a magic room in the house (the attic).

This particular system allows children to participate in a collaborative storytelling with a virtual friend (a 3D conversational agent). The child and Sam share a common space, the castle, where virtual and real worlds meet for storytelling.

2.4 Virtual Garden

Virtual Garden is a special garden that reacts to user movements and paths. A video based system will detect their movements, building the garden as they pass by: white flowers blossom each time someone moves or walks in the garden, the little rabbit runs to his burrow, while sparrows and butterflies wander around according to user's location.

This interactive installation is being used to stimulate children with disabilities; this way they can interact with virtual elements: grab the flowers, the rabbit and other activities.

3 OTTOMER: an Interactive Spatial Adventure for Children

oTTomer intends to be a mixture of different areas of knowledge, where several interactive technologies mingle with realistic scenarios and costumes, and animated characters invite children for an interactive adventure. The multiple devices integrated in oTTomer promote an immediate interaction with the system and a seamless immersion with the plot; this multiplicity contributes significantly to children's engagement with the plot.

oTTomer is a project where groups of children enter a spatial adventure that will transport them to a never seen planet where they need to help some creatures in trouble and solve several learning situations. The project was designed for children from six to twelve, including children with disabilities. Our goal is to develop an integrated interactive system that can be exported to several contexts, granting all children's access to the experience of learning by playing in an innovative way.

3.1 Story

oTTomer was conceived for a room with six divisions, each one with a specific decoration set, granting the simulation and immersion. All these rooms are entirely

integrated in the narrative and with the learning objects. Before presenting the interaction system, let's introduce the story and the characters.

3.1.1 Plot

In a distant galaxy there's a little planet called oTTomer that used to be a quiet and peaceful place to live, until the day horrific mutant Odoracs invaded the planet. Odoracs are mutating beings, commonly confused with Ogres that cross entire galaxies stealing and destroying everything. This day was terrible for all living species in Candralocka: the only city in the planet was destroyed and Lockis (little beings with magical powers) had to get help to survive. The rescuer was Sagumi, an ancient all-knowing bird that helped them closing the invaders in the Black Cave. To avoid possible escapes, they built doors in the cave and locked all the terrible creatures in this dusky place, giving the keys to Az'eno, a terrifying creature of the abandoned forest.

Many galactic years passed by and Odoracs might escape from the cave with the help of wanderer Odorac that recently arrived to the planet. Preventing a possible escape Lockis ask for Kara's help – Kara is the guardian-fairy of the Tree of Knowledge, where lives Sagumi. The fairy accepts helping the inhabitants but she needs extra help: Sagumi is getting weak and needs urgently of juicy berries… it's necessary to call for extra-planetarium help.

Children's main goal: stop arrived Odorac from getting the cave' keys and, if that mission cannot be fulfilled, confront him and decide whether to lock him up or to expel him from the planet.

3.1.2 Characters

There are many peculiar beings in oTTomer; let's meet the ones that appear in this episode:

- **Kara** [e.g. lovely from Esperanto] – The Flower Fairy, guardian of the Tree of Knowledge. She is Sagumi's friend and brings him juicy berries from the abandoned forest. Kara is Candralocka's counselor and has the ability of becoming invisible.
- **Sagumi** [e.g. wise from Esperanto] – The all-knowing mythological bird lives in the Tree of Knowledge. Sagumi's eternal life comes from the magic berries of the forest. According to ancient registries, a Sagumi lives up to 1500 years and cannot be killed but loses energy helping others.
- **Stellio** [e.g. spotted lizard from Latin] – This is a hybrid creature, half dragon, half serpent that guards the labyrinth, controlling all passages in the maze that holds oTTomer's maps.
- **Lumigi** [e.g. light from Esperanto] – These little birds that produce light are Lockis' pets. They enlighten their homes and other public spaces but in captivity they do not produce light.
- **Lockis** – oTTomer's inhabitants that descend from ancient tribe that populated the planet long time ago. Lockis are little beings; smaller than a human hand, very shy and always sleepy.

- **Aquila** [e.g. eagle from Latin] – Hybrid creature (half lion, half eagle) that guards the well and Picurius' magic. Aquila's feathers are magic and a secret weapon against Odoracs.
- **Az'eno** [e.g. donkey from Esperanto] – The strangest creature in the forest: head of raccoon, back and tale of deer, chest and nest of lion. Although very frightening, his body does not allow fast movements… but nature gave him the ability of imitate all kinds of voices. He is the guardian of Black Cave's keys.
- **Odoracs** [e.g. stinky from Esperanto] – Violent and unwanted these creatures are capable of the hideous thinks. The tribe has more than 40 elements, and a leader called Rolu, the worst of all Odoracs. They are intergalactic pirates that wander around galaxies frightening and stealing.

Once main characters were presented, let's introduce Kara's assistants, a team of outer space special creatures: gnomes, elves and pixies - friends of oTTomer's Royal Family (the children):

- **Gnomies** – A very quiet and diplomatic community that takes care of small plants and creatures. They're very persistent, serene, sincere and truthful; the best help you can get.
- **Elfies** – Beings with magical powers: in the dark, they turn invisible.
- **Pixies** – Live in small communities, capable of camouflaging themselves in the vegetation and similar colored objects.

The creatures presented above are an essential part of children's immersion: they interact with the story and learning situations becoming one of these beings, passionately engaging in the action. Personification is very important to ensure children's immersion in the story; having a specific goal to fulfill in the adventure and being convinced of the importance of their role in the plot, children will participate more intuitively in the action.

3.1.3 The rooms

oTTomer has 6 distinct rooms with different roles in this adventure:

- The Reception-Hall where children begin this journey: they are told what this adventure is all about and ordered to dress up for action;
- The Tree of Knowledge where Sagumi and Kara live and young heroes receive Sagumi's advices;
- The Labyrinth where lives Stellio and the place that they to cross to enter all the rooms. It's also the place where oTTomer's secret maps are guarded;
- Candralocka is a destroyed city, in ruins; used to be planet's only city. Here lives Aquila, brought by Sagumi to protect the well and Picurius' magic, of great value to Lockis. Children must find Picurius' old house to get some magic and collect an Aquila's feathers.
- The Abandoned Forest, Az'eno's home and the place where the magic berries grow. In the forest, children need to collect enough for Sagumi and the keys of The Back Cave, before the lonesome Odorac.
- The Black Cave the most terrible place at oTTomer where Lockis imprisoned Odoracs. This is the place where children must ensure that Odorac's won't escape.

3.2 The interactive technologies

In oTTomer, children can collect story elements and interact with specific situations in each room, changing story's progression. Each room has diverse learning situations, divided between physical objects and direct interaction devices.

Globally, there are several interactive systems: video and sensor based, color and sound detection, virtual agents and 3D graphics projection. For a better understanding of this complex interactive system, we will describe each room separately.

The Reception Hall - The Reception Hall will integrate motion, color and sound detection, 3D graphics projection and a simple augmented reality object: a mirror. The motion or sound detection systems identify children location, activating a 3D projection of Kara (with inherent virtual agent), that will tell children to dress up and explain oTTomer' story. In this room there's also a special mirror that reflects children's face in characters body, miming their movements - this mirror is of great importance for children immersion in the story. There are also interactive scenarios to show the correct path and a photogalactic machine that gets info about the young adventurers.

The Tree of Knowledge - The room where stands the Tree of Knowledge has also motion, color and sound detection, a 3D graphics projection and two virtual agents: Kara and Sagumi. The detection systems will trigger the different 3D projections of those characters, that will talk to children, explaining important details and tricks for this adventure (how to avoid Stellio, Aquila and Az'eno). In this room there are several interactive scenarios: moving rocks, butterflies and flowers. There's also an augmented reality device: the fountain.

The Labyrinth - The Labyrinth has also detection systems based on sound, color and movement that trigger Stellio's animation – he has one programmed trail, but any noise detected will alter his route immediately. Children have safe places where they can hide from Stellio and interactive scenarios like the batzone, the lava lagunas or Stellio's yard.

Candralocka - As for Candralocka, the existing technologies in the room are sound, color and motion detection (triggering Aquila's animation). This room has several interactive scenarios: the greens, the well (with augmented reality) and Picuriu's home. Aquila and Lockis are virtual agenst.

The Abandoned Forest - The Abandoned Forest has sound and motion detection systems that trigger Az'eno, varying according the detection of noises. In this forest, the interactive scenarios are the berries valley, the old bushes and the river. As for the virtual agents, they are the fishes, some berries and Az'eno.

The Black Cave - The Black Cave, a room with similar interaction systems: color, sound and motion detection systems (with implications in Odorac's behavior), and 3D graphics projection. This room is divided in 5 areas: 2 corridors, the Odorac's room, centipedes' and the geyser room. Several interactive scenarios and virtual agents grant the immersion.

There are two virtual agents systems that cross all these different rooms: the Lonesome Ogre and Kara 3D projection. Lonesome Ogre animation is a 3D projection is triggered after children enter in Candralocka; the only way to eliminate the Odorac is to shaken Aquila's feather near him, provoking a temporary incapacity

of moving. As for Kara's projection, it is always present in this adventure because she's children protector. During this adventure, there are several systems, beside virtual agents, that cross the whole experience:

- MP3 Player – These portable devices are part of children's costumes. They carry them along the adventure, receiving learning tasks by the system that knows exactly where children are located in each room; besides the 3D projection, there's also an inherent conversational agent that talks to children and answer some of their questions along the adventure.
- Interactive installations (based upon sound, motion and color detection) – These systems have a major role in the project: whether to show the correct path, to increase the immersion, to perform learning tasks or to get info from the user.
- eLearning platform – To store each learning object and manage the learning situations. As oTTomer will be a system available by school reservation, each teacher responsible for the visit indicates the knowledge level of each group and defines the learning tasks through the learning platform.

The learning parts of this project, although secondary, are always present. It's our belief that digital storytelling systems can largely contribute to the promotion of exciting learning experiences. In this project, each learning object will be triggered by children's portable devices (MP3 player), and the tasks can be performed individually or in group. The learning situations vary according to user's profile, location and knowledge level.

As oTTomer is a work-in-progress, some of these interactive strategies may vary during the project's implementation, according to new elements or existing and available technology. Following section presents project's future work.

4 Conclusion

Physically interactive storytelling systems set users in a straight relation between their actions and movements and the fictional world, where interfaces assume a significant and major role in the way they relate each other.

In this kind of environment, anything might be a mediation trigger: children movements, their hands, shouts or sounds – but we need a fully integrated strategy: is the interaction intuitive enough? Will children immediately know how to engage in the story? Are learning situations related with the story?

The way children interact with the story is intimately related with their immersion in the plot. oTTomer is an adventure that enables spatial immersion: children build a notion of space that sets them in the place where the story happens. The scenario is of great importance to that immersion; building credible scenarios, fully-integrated with the story will certainly contribute for a major immersion.

The presented adventure is the first episode of a series, where characters and users will live more complex experiences; it is our intention to develop a multi-interfaced story, building an imaginary world playable in all different media - Internet, iTV, gaming, animation, literature, and others. Some adjustments will be needed and that is

exactly the next research subject: what kinds of changes are needed to apply the same story in diverse media supports?

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Methods for evaluating a dramatic game

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Abstract. This paper describes ongoing work on creating a dramatic gaming prototype. A specific problem is how to evaluate the game and the gaming experience as there are no existing methods specifically suited for this purpose. Two methods are presented that aim to capture different aspects of the players' subjective experiences. One of the methods, the sensual evaluation instrument, is an experimental non-verbal method that attempts to capture players' immediate emotional experiences. The other, Repertory Grid Technique, is a method for eliciting and evaluating people's subjective experience of interacting with technology, used after the gaming session.

1 Introduction

For creators of interactive stories a question of particular interest is (or ought to be) how to evaluate their systems/stories? What kind of experience do they provide? Do they provide a narrative experience? Do they provide the intended experience? These questions need to be answered in order for authors of interactive stories to learn where their systems were successful and where they were not. For instance an interactive story system may have a solid implementation and good underlying ideas about how to create interactive narrative, but fail because the story that is told is bad. Vice versa, the system may succeed because the story is fantastic although the story telling system is not. To some extent these two factors are interrelated but are not completely co-dependant. Evaluation is particularly important during design of a system, so that strong and weak spots can be identified early on.

Below we give a brief overview of a dramatic game that we have been working on and present some ideas for how to evaluate the game and the gaming experience.

2 A Dramatic Game

We have been working on a dramatic gaming prototype that is currently being implemented in its final version. The prototype strives to create an experience that is both a gaming experience and a dramatic story, an experience we have named *dramatic gaming*. The game is not action packed like many contemporary games but

rather focuses on social and emotional interaction. The scenario focuses on three girls arranging a party. Taking on the role of one of the characters, the player is called upon to make decisions in arranging the party that have social and emotional consequences, e.g., who to invite, or where to stage the party. As unfolding of the story is partly determined by the web of relations between characters (who is on friendly terms with whom?, who is in love with whom? etc) a fundamental aspect of playing the role is to be sensitive to, maintain and/or improve social and emotional relations with other (computer controlled) characters in the game.

The story world is a 3D world which players view from a first-person perspective. Players interact with characters by typing text or by choosing from a set of predefined statements that are available. Players also have access to various props such as mobile phones, magazines and diaries that all have their dramatic function in the game.

The fundamental problem of interactive stories lies in how to combine a story, which is basically a linear structure, with interaction which disturbs this linearity. Finding solutions to this problem is a requirement for creating stories in which readers/ spectators/players/users are invested with power to truly influence the storyline. The prototype addresses the problem of combining narrative with interactivity through anticipatory planning [11]. The basic idea is to continuously predict how the story will evolve and take action if an undesired chain of events is predicted. Thus the story can be nudged in a desired direction. However a good story can not be guaranteed. If the player chooses to s/he can ruin the dramatic experience by not "playing along".

In addition to the story generation mechanism the prototype also addresses the surface representation of interactive stories. As interactive stories are still a new medium they have yet to find their final form. As social and emotional relations are an important aspect of the game we have worked with cinematography as a means to enhance the social and emotional content of the game. Cinematography refers to *how* something is filmed – in contrast to *what* is being filmed – and typically involves three factors [1]:

- *Photographic aspects of a shot,* e.g. how a shot is illuminated. For instance a shot can be very dark and gloomy, light from the sides casting sinister shadows, or it can be bright and happy.
- *Framing of a shot,* i.e. what is included in the camera rectangle and its location within the rectangle. For instance, a shot can be centred on a person talking to someone outside the frame, or both persons can be visible on opposite sides of the frame.
- *The duration of a shot*. A shot can be very long, e.g. showing a person giving a speech, or short, showing the person giving the speech and then rapidly cutting to the audience's reactions to the speech. As a general rule shots last between two and eight seconds.

By altering these factors different dramatic and emotional effects can be constructed although the content remains the same. In addition we have been inspired by comics that often use shape and colour of panels to convey emotions and attitudes [12] [10] . Fig. 1 shows examples of some shots produced by the system.

Fig. 1. Shots produced by the system

3 Evaluation Methods

Currently there is a lack of methods or metrics to use when evaluating games or other entertainment applications. Neither are there any universally agreed on definitions of basic concepts within the field such as what constitutes entertainment or pleasure. An evaluation of the dramatic game *should* find out whether we succeeded in generating a dramatic experience, a social experience and an emotional experience and finally whether the experience was enjoyable or not. In addition it should reveal how the different components of the system (story generation, cinematography, etc) contributed to those experiences.

Wiberg [14] gives a good overview of attempts to operationalise concepts such as pleasure/fun. According to Tiger [15] and Jordan [7] pleasure can be divided into four dimensions:

- Physio-pleasures
- Socio-pleasures
- Psycho-pleasures
- Ideo-pleasures

Physio-pleasures relate to pleasures derived from sensory organs, such as smell or touch. Socio-pleasures are derived from relationships between people or relationships to society in large. Psycho-pleasures are derived from individual activities that often involve using skills to perform something which is emotionally rewarding, e.g. painting. Finally ideo-pleasures are derived from consumption of – and reflection upon – values and ideas from various sources such as books, films or newspapers. The importance of these various dimensions for evaluating fun in games will likely vary depending on the design of the game, the values conveyed by the game, which modalities are used to interact with the game (text, speech, mouse, keyboard, gestures,…) and so forth. For the dramatic game at least socio-pleasures and to some extent psycho- and ideo-pleasures seem relevant.

A concept often used in games research to describe a very desirable state is *flow*. It is described as: "the state in which people are so intensely involved in an activity that nothing else seems to matter; the experience itself is so enjoyable that people will do it at great cost, for the sheer sake of doing it" [2].

Flow seems to describe a situation in which players have become so engaged that they 'disregard' the physical circumstances of the playing situation or the technical features of the computer game, and instead 'enter' the story world, focusing on the events and become cognitively, emotionally and morally engaged in the lives of the characters. Hence were it possible to detect the degree of flow players of the dramatic game were in it could provide us with an idea of how fun the game and the story is.

Pleasure and flow are just two examples of dimensions that can be used to describe a successful gaming experience. For instance, in a recent preliminary evaluation of the interactive drama façade [9] *agency* was one of the most important dimensions. Agency refers to the users experience that both immediate and long-term effects of their actions are related to their goals.

Pleasure and flow are both ephemeral and partly subjective qualities so how can they be evaluated? To answer similar questions researchers within other fields such as affective computing have started to turn to other disciplines – such as art – for inspiration [5]. The studies that have been done have adopted qualitative methods that try to capture the subjective and specific experiences of users instead of attempting to create generalisations that prove unusable in the end. Wiberg [14] also discusses pleasure as a partly subjective quality arising in the interaction between a subject and some object. Rather than an object *causing* pleasure in a subject it is the subjects interpretation – or judgement – of an object that determines weather it is perceived as pleasurable or not.

The kind of evaluation we are interested in should not be viewed as a proof in the traditional science/engineering view. Rather, by capturing and *interpreting* users' subjective comments, body language, facial expressions (etc) an *understanding* of the users experience is gradually constructed. In the sense that the dramatic game is a *design experiment* it is appropriate to adopt a methodology closer to art and design disciplines than pure science and engineering.

To ensure that the components of the system actually contribute to the gaming experience we will adopt a two stage evaluation process inspired by Höök et al [5]. Thus we will first evaluate if the components of the system achieve their goals (e.g. to enhance social and emotional expressiveness for the cinematography component) separately. The output from these evaluations will feed into the loop and affect the design. Once the design has been completed the second step is to evaluate whether the overall system succeeds in producing an enjoyable dramatic gaming experience.

Below we discuss two methods that we plan on using both during the design and final evaluation of the dramatic game.

3.1 The sensual evaluation instrument

The sensual evaluation instrument is an experimental tool for non-verbal self report of affective state that is being developed within the HUMAINE[15] network of excellence [6]. It attempts to exploit the fact that some information processing has been shown to occur at levels other than the cognitive/word oriented levels of the brain e.g. affective processing (e.g. the primal nature of fear: http://www.nimh.nih.gov/events/ledoux.htm). Yet most forms of evaluation rely on verbal reports from users of their experience. Likert scale type items (e.g how enjoyable was this interaction? Circle the number from 1-7 that best fits.) are still the most common subjective quantitative measure used. In contrast the sensual evaluation instrument attempts to be a purely non-verbal method.

The current version of the instrument consists of an object set with objects of various shapes that illustrate different emotions/experiences. Fig. 2 shows an example of two objects from the object set. The basic idea is that instead of verbal reports of their experiences subjects would instead arrange objects in a way that subjectively reflects their experience during an interaction with a system. The exact process for how to arrange these objects is still work in progress. In informal user sessions using an earlier version of the object set to evaluate a computer gaming experience, subjects were simply asked to move objects that reflected their current emotions closer to them and vice versa.

Fig. 2. Examples of objects from the sensual object set

A benefit of the instrument is that it allows users to express multiple simultaneous, and possibly conflicting, emotions which are usually very hard to capture. Prior to using the object set subjects calibrate it by arranging the objects in Russels circumplex model of emotions [13]. Hence it is possible to compare subjects' use of the objects although they may have assigned different meaning to them. The initial experiments showed that the set of emotions that was desirable to communicate differed from e.g. Ekman's category-based model [3]. Hence the objects represent emotions such as flow, boredom and confusion that were found to be desirable to communicate when evaluating a game. As of yet it is unclear what kind of

[15] See http://www.emotion-research.net/

information an evaluation of the dramatic game with the sensual evaluation instrument can provide. It seems likely that during the design process the instrument can point to problematic areas in the design – e.g. the subjects seem confused or "out of flow" at this point – but not give any details about exactly what is wrong. Is it the story, the interaction or both? In addition as subjects occasionally rearrange objects we can gain a picture of the dynamics of the experience. Was in fact a dramatic experience created with tension rising towards a climax or not? Finally the instrument can likely tell us something about the complexity of the experience (i.e. the story). If the experience is complex a larger number of objects will likely be used and rearranged more frequently than if the experience is simple.

3.2 Repertory grids

The Repertory Grid Technique (RGT) is a method for capturing the experiential and subjective aspects of interacting with various forms of technology based on Kelly's Personal Construct Theory [8]. Fällman and Waterworth [4] provides a good introduction to the methods underpinnings and use. The problem with subjective experiences is that either the subjects are allowed to express themselves freely rendering the evaluator with lots and lots of qualitative data that cannot be structured and measured across subjects, or the evaluators will set the boundaries of what can be said through deciding on the questions in a questionnaire or similar. In contrast the basic idea behind RGT is to elicit a set of personal constructs (or dimensions) that are bi-polar in nature along which the object of study is evaluated. For instance we tend to judge other people along dimensions such as tall-short or light-heavy [4].

During the elicitation process subjects are asked to classify three objects at a time, telling the experimenter which ones belong together and which does not. This process is called *triading.* Subjects are then asked to tell the experimenter why the two belong together and not the third. This classification brings out a set of bi-polar scales that are then used to describe the qualities of the designed artefact at hand. The data from all users is entered into a gigantic grid with all the subjective scales that all the subjects have come up with. Through collapsing those that belong together, patterns of descriptions arise. Thus, the method is both quantitative and qualitative.

As the dramatic game is a subjective experience one of the most appealing aspects of RGT is that it is based on how users experience the game – not on pre-conceived notions of what the qualities are, or should be, put together by researchers. Hence it can help us to gain a deeper insight into users' experiences and possibly find important (missing?) qualities in the system that might otherwise have been overlooked. Most importantly RGT may provide us with more detailed answers about what is right or wrong than the sensual evaluation instrument. If applied to the gaming experience itself RGT may even provide us with answers to questions regarding the quality of the story itself. One way of doing this would be to compare gaming session from several different games. If the drama game session was experienced as a story constructs reflecting this would likely appear. Likewise, if the experience was perceived as a social or emotional experience this might also be reflected in the elicited constructs. Another way of going into the details of the story could be to partition the gaming session into several "chapters" and apply the triading technique

to the chapters themselves to examine the perceived differences between various parts of the story. If the gaming session was indeed experienced as a story we would expect constructs reflecting this to show up in the elicited constructs. These are just some examples of possible ways of using RGT. Experiments will have to show which ways are successful and which are not.

4 Conclusions

The *dramatic gaming* prototype strives for an experience that is both a gaming experience and a dramatic story. The two methods described can provide us with different kinds of information regarding the players' subjective experiences. While the sensual evaluation instrument may provide us with an overall picture of the experience, with a focus on immediate non-verbal reactions, RGT can give us more details in a subsequent post-session analysis of the experience. The presented evaluation ideas are still in their early stages and will have to be empirically tested.

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The Potential of Imagine and Magic Forest for the Construction of Technological Enhanced Interactive Narratives, by Children

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Abstract. We believe that Imagine [7] is a new kind of integrated educational software, comprising a richly connected and layered set of tools and frameworks, designed to integrate with and extend all areas of learning. It can be used by pupils of all ages and ability. It is a modern computational system for learning with ambitions to support and stimulate emergence of new cultures of constructing, exploring and understanding.
Magic Forest is a microworld for young children aged 4-8 years old, built in Imagine, as a product of the Playground (http://www.ioe.ac.uk/playground) Project. Magic Forest is intended to be a simple and powerful environment for young children to build games by expressing rules. Besides being simple, the whole interface was built with children in mind, and has a professional and funny look. The Magic Forest engine is named as Pathways in several scientific papers.
Along MINERVA project CoLabs (http://matchsz.inf.elte.hu/colabs/), we researched tools and methods for integrating Imagine into local learning settings. We developed strategies for proper integration of Imagine into teaching / learning processes in different settings (different levels of education, different countries and regions, different age groups and disabilities, non-formal and formal contexts) [2].
On this paper we will show some examples of work done with Imagine by children aged 9-10 on a Portuguese school. We will also give a small description of the Magic Forest environment. This paper is an extension of an oral presentation made during the KALEIDOSCOPE SIG NLE workshop, held at Lisbon from 9-10th of June, 2005.

1 Imagine

The examples above show the use of Imagine on a scholar context of a class of children aged 9-10. Subjacent is a collaborative framework, both on preparation and during the action process. These aspects point to the fact that the process is more important than the obtained final product. The work followed a project methodology and was developed on a synchronous mode, on the same place [4]. The main idea was to gain a better and broader comprehension of poems by building from them a visual animated multimedia presentation. On the group appropriation of the poem polysemy,

other bridges were launched across the curriculum, integrating both school library and Internet search.

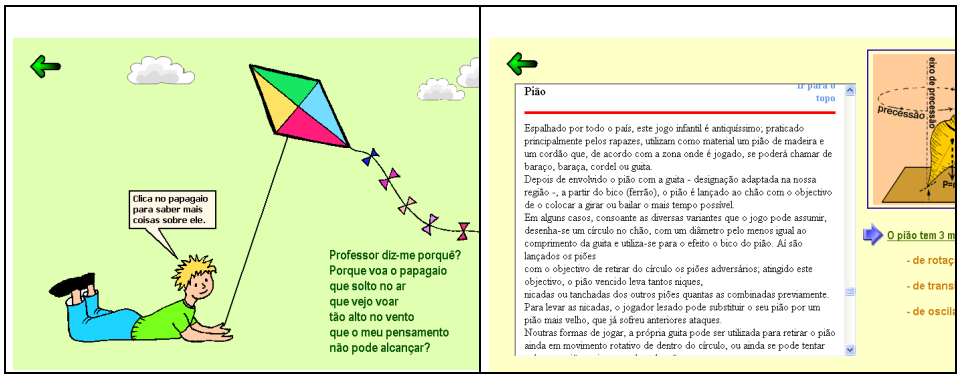

Fig. 1. Animated illustration of a poem "Teacher, say me why?"
The drawings were made by the children and then digitalized. The voice was recorded. On the right a searched web page about tops and its 3 movements

Behind this work is a constructivist perspective, where individuals are active agents on the construction of their own knowledge. On this process, although, we can't forgot the social and individual development of each one person, taking into account not only the inter and intrapersonal dimensions, but also the Vygotsky "proximal development zone", as a bridge between the actual level (independent problem solving skills) and the potential level (coached and/or collaborative problem solving skills). On this collaborative knowledge building process, learners need support from each other and they need also adults coaching and scaffolding.

We believe on a School that enables and promotes shared learning spaces, rich on diversified resources, mainly technological ones, where each one develops the sense of belonging to a community of practice [8] while appealing learning contexts are built on the balance between:

- Active participation;
- Planning and spontaneity;
- Compromise on challenging tasks;
- Active use of creativity and imagination;
- Convergent and negotiated interaction processes.

Fig. 2. Another poem "Words cleaner"
The illustration of each keyword on the poem is a deep semantic exercise of creativity

2 Magic Forest

Building new microworlds in Logo it is an easy task. Logo is one of the most suitable platforms for this goal, because it is a familiar high-level language understood by many teachers, educators and researchers. They can construct microworlds that fit their personal needs. But when a professional look & feel is required, it can be very hard to achieve.

Imagine provides a complete and new object-oriented vision of Logo. It makes it possible to build object-oriented environments easily. Features such as speech recognition, text-to-speech, force-feedback joysticks, network communication and driven events programming makes Imagine the right choice to build a powerful microworld, like Magic Forest [2].

The research goal of Playground project, where Magic Forest grown-up, was to investigate how children can learn about rules and how they can be modified and expressed through designing interesting and challenging games.

Playground design took place concurrently with studies of children learning across a sample of European schools and clubs. Evaluation of the children's games, game creation and learning outcomes were focused on cultural and conceptual issues and developmental variation.

The technological goal was to offer children a virtual playground with the facility to express powerful rules to objects in simple ways. This has been achieved by developing a new iconic language (Pathways). This language is based on the notion

that rules can be defined as having two types of element, conditions (events) and actions.

On analyzing the games build or modified by boys we realized that they prefer action games. On the other hand girls have a tendency to include more elements from the childhood imaginary, and their games tend to be more narrative [1].

2.1 Building rules and games

"*When young children work with Pathways, the ideas that they have in their heads about the games they want to create are very important. They are important to the children because their work belongs to them and they are not simply regurgitating what adults have told them to do. They are important to their teachers because of the motivation that this ownership stimulates. And, not insignificantly, they are important to us, the researchers, because we want to learn about the children's thoughts as they engage with the entire process of creating a game.*" [6].

Consider a Space Invaders game, a good example of how children might build a game in Pathways. For a simple version of the game we just need two types of objects; the space shuttle and the aliens.

First a child would create a new object and change its appearance, using the Starfish tool. When the Starfish is used to click on the object, a new box (Figure 3) appears, making it possible to change lots of the properties of the object, like the shape, heading, speed and size. Suppose the child chooses a space shuttle shape (Figure 4). For children, the image of an object is very important, so it must be easy for them to change it.

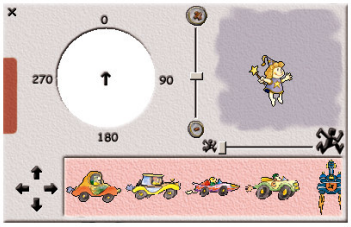

Fig. 3. Before changing the object shape

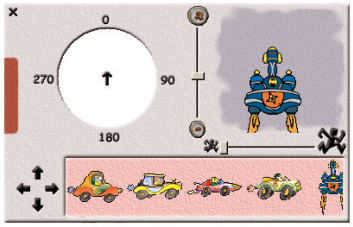

Fig. 4. After changing the object shape

Some rules must be created in the space shuttle object in order to give some life to the object. The child may decide that they want the player to control the space shuttle through a joystick. The child needs to add a behaviour stone to control the object in this way (Figure 5)

Fig. 5. Rule for controlling an object with the joystick

The child may want the space shuttle to shoot, perhaps by clicking a joystick button. The child could add an event stone "When the joystick button 1 is pressed" into a new rule. Then he might add the action stone to shoot a laser and play a laser sound. The inputs of the stones (number of the joystick, type of bullet, sound) can be changed by clicking in the input image of the stone.

Fig. 6. "When the joystick button 1 is pressed, I shoot a laser and play a sound"

Now, the child has a space shuttle, controlled by the joystick, which fires some lasers when the joystick button 1 is pressed. What would be often a complex rule in other environments for young children is rather simple and straightforward in Pathways.

The child may also want an alien that moves randomly, though many other possibilities are available (such as fixed movement, or movement towards the space shuttle). The child may now decide that the alien should explode when the laser hits it. With the addition of one more rule, this idea could be realised. Alternatively, the child might prefer that the alien shoots back or moves around. All these things are possible.

In Figure 7, the child may choose a shape for the alien.

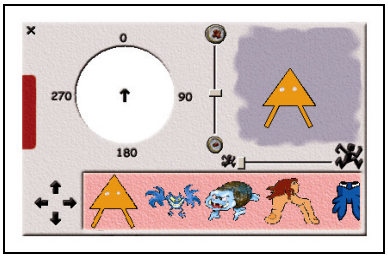

Fig. 7. Changing the object shape to an alien

The child may want the alien to move horizontally. To do this, the child must specify some initial parameters. The child might use the event stone "When the game starts". In this case, the initial settings of the alien that the child needs are speed, to make it move, and direction. For this there are two action stones, which allow her to set speed and heading. The complete rule is in Figure 8.

Fig. 8. Rule: "When the game starts set speed 5 and set heading 90 degrees"

In order to make an interesting game, the child may want some interaction between the space shuttle and the aliens such as described below. Figure 9 shows the rule "When I am shot by a laser, I explode". Once more the rules are very short, easy to understand, easy to create and easy to modify.

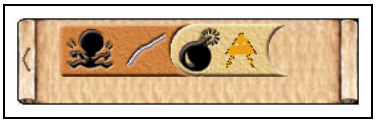

Fig. 9. Rule: "When I am shot by a laser, I explode"

Now the child has two objects in her game. If he would like more aliens to make the game more interesting, he could use the magic wand to make copies of the first alien object. Then he only has to arrange the aliens and the space shuttle in appropriate positions. The child may want a more interesting background. A simple change that transforms what the game means to the child. To save the game, the child simply presses the CD button in the Toy box.

3 Some Conclusions

Imagine and Magic Forest are really very powerful environments. We think they are a good choice for building narrative learning environments in an easy way.

Imagine due to is object oriented approach enables the learner to focus on the properties of each element of a narrative and on how each of them interact with each other. The whole interdependency appears, like this, as an emergent behaviour.

Magic Forest with the iconic rules based object programming language makes it easy to animate any situation, should it be a narrative, a game or a simulation. On the path of the Magic Forest success, two new products will be launched using the same engine: Dragon & Pathways and Magic Forest 2.

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Narrative Contents in the Universe of LEGO High-Tech Toys

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Abstract. This paper analyzes examples of using narratives in the universe of LEGO multimedia children toys. As these toys require a certain amount of technological knowledge that average children do not posses or might have difficulties to obtain, narratives are successfully used for making children interested in the specific challenges and for motivating them to start on the learning curve. I argue that narratives could potentially have significantly broader implementation, allowing for actual learning of mechanical constructions, computer programming, and other technical contents in a more efficient and joyful way for more children, and that research efforts in this area could be fruitful.

1 Introduction

In addition to small plastic building blocks known for more than last 50 years, LEGO is marketing toys that contain a significant amount of modern technology. These "technology" toys, in LEGO universe, could broadly be divided into two groups:

1. LEGO Mindstorms line, construction sets that together with plastic bricks contain a programmable brick (microcontroller embedded in the brick), different sensors, motors, as well as a rich graphical programming language (http://mindstorms.lego.com)
2. LEGO Digital Designer line, a virtual on-line 3D software environment, that allows for construction of virtual LEGO models in 3D virtual universe, following the same rules as building real LEGO models of plastic bricks (http://www.lego.com/eng/create/digitaldesigner)

However, it is not quite easy and intuitive how to use these toys – certain skills are needed for enjoying these environments, and it seems that before children could play and enjoy their toys some learning aspects have to be involved. It is even possible to describe these technological toys as a paradox – in order to learn how to construct and program robots, or use 3D virtual environments, adults go to schools or courses for

years, and then practice those activities for monthly salary, but we expect children to do very similar activities without any training and just for fun!

However, what could be stated for users of LEGO technological toys is that they have:

- No prior experience and sufficient knowledge of the domain;
- No other motivation to fulfil the task but inner interest.

Thus, the main questions that developers in LEGO face considering these toys are:

- how to give the minimum of needed knowledge to start the activity;
- how to add to that knowledge continuously ("just in time instruction");
- how to keep an interest to continue, finalize, start another piece of work?

The known fact is that users (and particularly children) do not read instruction manuals. Moreover, writing an instruction manual for a full-scale graphical programming language like RoboLab would require writing the complete programming-course book (a sort of that is [1], with 241 pages, meant mainly for teachers using RoboLab for their classes). So some other ways need to be found.

Also, learning to program only is not enough for joyful Mindstorms play - without certain knowledge of mechanical constructions, it is impossible to proceed.

The first Mindstorms bow on the market, back in 1998, was completely open-ended construction kit, with just a couple of exemplary models. Soon afterwards we realized that average children do have a problem of continuing - when they are done with exemplary models from the box, their building and programming skills are still too limited to continue with realization of their own ideas, even if they do have their own ideas.

To bridge, fulfil, help, LEGO developed several sequel products, with idea to:

- give some reasons why to build something else
- suggest ideas what to build
- show more different samples how to build and program

Examples (http://guide.lugnet.com/set/?qc=lego/mindstorms/expansionset) of those products are :

- Mission to Mars;
- Extreme Creatures;
- RoboSports;
- Ultimate builder set.

The first three sets contain just some more plastic bricks and ideas how to build several concrete models in pretended-to-be Mars environment, sports arena or animal kingdom, and they were not very successful on the market. The fourth set ("Ultimate builder set") goes much deeper into core of LEGO Mindstorms constructing and programming, successfully using multimedia tools, including narratives, to boost

interest, explain modular building and different usages of the same sub-constructions in completely different models, as well as personal presentations of some real LEGO employees who developed certain models. I would argue that this is a very good example of usage of motivational narratives for learning.

Fig. 1. Sample screen from "Ultimate builder set" CD

Figure 1 represents a sample screen from Ultimate builder set. Interaction with user could go as follows:

1. the user chooses the model he would like to know more about or build from list of modules on the left hand side of the screen.
2. For the chosen model, in the field (2), instead of just a photograph of lots of LEGO bricks, a film with a LEGO designer (different one for each model) appears and starts.
3. Together with spoken story, the same text slowly scrolls below the movie, so that multiple representations of the same message are present together, enhancing understandability.
4. The designer tells the personal story about his interests and motivation to build exactly that model, and shows different features of the finished model. With buttons familiar from lots of movie-players, the user can stop, pause, restart, or go to the end of the movie.
5. With four buttons at the bottom of the screen, the user could choose to investigate modules needed to complete the model, get instructions to build the model, program or test it. He could choose these actions whenever he wants – he does not

need to listen to narrative first, he might opt to investigate modules himself, and hear a story about them later.

However, in this example narratives are used very successfully, but as an inspiration and motivation only. Building instructions are presented in a formal LEGO way, and programs are just given as finished units, so the user needs to understand them himself, by observing program icons and robot behaviour. It would be interesting to investigate if the usage of narratives could be expanded to actual learning of constructing mechanical assemblies and programming. Existing literature about narratives in teaching/learning mathematics and programming [2-10] suggest the positive answer to this question.

Other examples of using narratives in LEGO Mindstorms universe are from Mindstorms web-page, www.mindstorms.lego.com, where LEGO tried to attract more children and adults to Mindstorms universe.

"The untold story of the Ultimate builder set", on http://mindstorms.lego.com/eng/products/ubs/ubsuntoldstory.asp, gives the "behind the scene" real story how the actual set was designed. The idea was to fulfil natural curiosity of users how some actual product has come to being, and ideally to inspire them to use the product more.

On http://mindstorms.lego.com/eng/inventions/ there are "Pioneers" section, "New inventions" and "Mindstorms legends" sites. "Pioneers" site contains stories of 5 real persons, not LEGO employees, who tell their personal stories about their motivation and work to develop their own Mindstorms robots, as well as descriptions of those robots.

2 Reflections on the considered issue

Building/programming LEGO robots is by its nature an open-ended activity. It is generally impossible to predict what a skilful user could build – taking into account richness of LEGO construction bricks, which include different types of electric, wind-up and pneumatic motors, and richness of an iconic programming language (based on LabView language from National Instruments, a full scale iconic programming language for adult professionals) .

It is also almost impossible to guess what the child is building, even if we would have some system to track what the child is building (from analyzing a digital model from LDD, for example) – same modules could be used for completely different constructions, like Ultimate builder set explicitly shows. However, it is possible to engage a child (an user) in some dialogue, which should include elements of AI, to figure out what is his/her intention, and offer some inspiring or helpful story.

In an environment like this, which connects physical objects with abstract activities (plastic bricks and programming) via multimedia inspirational material, several open questions could be easily asked, and research topics formulated.

For example, should we use more personalized stories? Could we use them only to keep the interest of our users? Could we use them to teach programming, too? Should we give some examples of successful mechanical constructions?

Do we need to "invent" some characters? A virtual friend; maybe? Or organize a discussion forum on the Web, with a moderator who will "jump in" with some stories, tips-and-tricks and similar tools to boost up the discussion and learning of discussion participants?

How to introduce the stories in order not to distract advanced users?

Another interesting question might be which voice to use while telling the narrative in a multimedia environment. There are several options:

1. computer synthesized;
2. hired actor
3. model/program developer (real person presenting results of his/her own work)
4. In LEGO universe, we tried all three options, and our experience shows that our users prefer the last option, as it connects them to real world.

3 Conclusion

In using narratives in LEGO universe we have to be honest in what are we doing, to minimize possible negative effects of "sugaring the pill" process. At the end of the day, we do need to teach children some basic mechanical constructions, some programming techniques and some aspects of a 3D user-interface. Examples include:

a) how to construct and modify some of the motor modules from Ultimate builders set; with explanation of number of outputs and power of each output;
b) some programming algorithms, for example "containers container" loop in RoboLab to clean whole memory of RCX; and
c) how to use a hinge tool to move dependently connected bricks in a virtual 3D environment.

Inventing long stories about these very technical issues could be even counter-productive for vast categories of users. On the contrary, I deeply believe that giving a nice, maybe personalized, stories in different places in the environment, motivating children (the users) to investigate the environment and to figure out how and why some new elements of the environment could be used, which new constructions and programs could be developed and how, what works in certain environments and what does not work, could be extremely beneficial and could open doors of LEGO, and not only LEGO, world of mechanical construction, programming, artificial intelligence and other different ways of interacting with technology for lots of different children

who would otherwise be put down with high technical demands needed for LEGO play.

The aim of future work in this area is to investigate and figure out how to develop those relevant "technical" stories and how to integrate them best in multimedia high-tech environments of edutainment LEGO toys.

I do not believe that "narationalizing" (or "storifying") LEGO model building and programming processes is impossible or not desirable process. I do believe that narratives could play an important role in LEGO technology universe, as:

- giving and keeping motivation;
- providing needed necessarily initial and "just in time" instructions (teaching users essential skills required to start and continue the process)
- making the whole LEGO experience more accessible and enjoyable to more kids, not only those "technology-oriented freaks".

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Part 2

Reports on the work of the Discussion Groups

Report on the work of Discussion Group 1

From Learning and Narrative Theories to Learning Environments

Participants:
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Discussion Group 1 focused on narrative theories and learning approaches. The starting consideration was that an overall framework for investigating technological narrative learning environments should be based on research findings regarding both learning and narrative, as well as on the current technological approaches to these two areas. Attention should also be paid to practical expertise in the development of such Learning Environments.

The term *learning environment* may be interpreted in different ways, and hence, in order to work on solid ground, the group decided to give a precise definition of how this term would be used. The group chose to call *learning environment* any environment that surrounds a person who is involved in learning. If a person uses ICT in any form for learning, then we talk of Technology Enhanced Learning Environment (TELE). A TELE therefore consists of a physical space, such as a person's private room, several ICT components, e.g. a computer and a multimedia program on CD-ROM, and the learner him/herself. A TELE might also include a high degree of human interaction, as in the case of a complete course, in which peers, tutors and teachers work with the help of technological facilities.

A framework for investigating Technology Enhanced Narrative Learning Environments (TENLEs) should also include a section on the evaluation of such TELEs with respect to the amount of learning they can give rise to. Since there are presently no theoretical methods to guide such analysis, criteria for the construction of effective narrative TELEs may be derived from observing and evaluating a number of narrative TELEs with respect to the support to learning granted to users. In order to suitably approach such analysis, it is necessary first to define what *learning* means. A look at learning theories might be useful to this end. In psychology, there is a distinction between behavioural and cognitive learning theories. From the point of view of behaviourism, learning is defined as a change in behaviour that can be related to some event that preceded or followed the behaviour in question. From the point of view of cognitive psychology, on the other hand, learning is conceived as the acquisition of knowledge and skills. In our opinion, both views fail to stress the importance of emotions and motivation in learning. Behaviourist theories do not try to clarify inner processes that guide these psychological phenomena, while cognitivist theories do not give due importance to the influence that initial drives and emotions have in cognitive processes.

In contrast to these psychological definitions, the discussion group agreed to start from a perspective in which personal meaning-making - hence a more constructivist approach towards learning and learning results – plays a central role. In this perspective, the general goal of narrative learning is *developing a personal understanding of a learning task and content*. Carola Conle suggested distinguishing four aspects of this personalisation:

- an increase in understanding
- an increase in interpretative competence
- a richer practical repertoire
- changes in life (attitudes and behaviour)

Subsequently, the discussion group addressed the question of how personal learning can be measured in research. Three ways in which research can collect evidence that personal learning has taken place were specified:

- moments of encounter: the moments when the user is actually touched by a story, a phenomenon called resonance, occur. 'Resonance' can be described as "a metaphoric experience triggered by someone else's experience through the act of receiving a narrative";
- demonstration of the acquisition of specific contents;
- changes in life (attitudes, behaviour)

Obviously, it is difficult to observe moments of encounter and even more so changes in life. One cannot just take for granted what respondents may say about the matter, especially since remembering is a narrative construction process itself and stories and their meanings will therefore undergo changes almost constantly. Therefore, some precautions need to be taken in this kind of research. The discussion group suggests the following:

- Because a qualitative research approach will often be necessary to gain insight in moments of encounter and personal resonance, triangulation is important;
- Also measuring a 'trail of encounters' (i.e. longitudinal studies) can help to develop a more rigid interpretation over time that includes reoccurring processes of meaning-making and re-interpretation;
- In addition, creating different platforms of collaboration might help to collect data on moments of encounter, because opportunities for encountering and for resonance are then created.

Besides the learning goals of TENLEs and how to measure them, the discussion group talked about the possible roles narration and narratives can assume in learning environments, because these can be very different. In this respect, two general roles of narrating were identified:

(1) *the individual as a recipient* of narratives. In this case, the individual's account reflects his subjective experience of the narrative s/he was exposed to;

(2) *the individual as a constructor* of narratives.

In both acts, narratives can take different forms and refer to different contents. In the discussion group, the following general types of narratives/stories were liste:

- experiential;
- fictional;
- explanatory:

Authoring one's own biography is an example of *experiential* narration. The mere act of narrating one's biography tends to give it authority; it could be considered to be a kind of truth telling.

We find *fictional* narratives in many novels and stories. Characters and plot are "made up", as a product of the author's imagination – which does not mean that they cannot include parts of the author's biography and real facts. Encouraging people to create fiction can help them to develop imagination and to learn how to express themselves.

Explanatory story telling may be found in narratives that are essentially fact-based and try to explain a specific phenomenon. An account of metabolism would be a fitting example.

Often, a narration will contain aspects of more than one kind of story, but usually the learning task is set in such a way that it aims at one kind at a time.

While the group did not focus on technological aspects, it was agreed upon that any TENLE should take into account factors like:

- age of the user group;
- domain;
- degree of interactivity.

This last item refers to interactivity with the TENLE as well as with peers who might have the role of co-authors, or teachers.

In conclusion, this discussion group focused on the general aims of Technology Enhanced Narrative Learning Environments and defined these as specific aspects of personal understanding. Next, the discussion focused on clarifying how research on TENLE can collect data on the development of personal understanding and by pursuing this question provisionally defined three aspects to look for, namely: moments of encounter and resonance; acquired content; and changes in attitudes and behaviour. The discussion continued by identifying the different forms and contents that are related to narrative learning, and paid attention to two acts (receiving narratives and constructing narratives) and three contents (experiential, fictional and explanatory narratives).

The discussion explored the contours of a very general framework that may guide research on TeNLEs and give rise to further exploration in, for example, the following directions:

- How do different learning domains relate to the four learning goals (understanding, interpretative competence, practical repertoire, life changes)? How can these learning goals be further specified within each domain? Is narrative learning more appropriate for certain domains than for others?

- How can the two general acts of narrating (receiving, constructing) be supported by technology? By what technology?
- How do the two general acts of narrating (receiving, constructing) relate to the four learning outcomes (understanding, interpretative competence, practical repertoire, life changes)?
- How do the three kinds of narratives (experiential, fictional, explanatory) relate to the four learning outcomes (understanding, interpretative competence, practical repertoire, life changes)?

Report on the work of Discussion Group 2

Case studies of Technology-enhanced Narrative Learning Environments

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The discussion group dedicated to the analysis of case studies explored a number of issues related to the different ways in which narrative is conceived, implemented and exploited in technology-enhanced learning environments so as to give rise to a variety of learning experiences. A major aim of this analysis was trying to understand what might be the role and added value of using a story or a narrative in such environments. In order to contribute to the development of an overall framework for NLEs, the group focused on building a categorization of the different kinds of NLE currently available; this was approached by highlighting different features which allow one to distinguish the various kinds of applications in a meaningful way, so that comparison among the different environments would make sense.

One of the features that was considered for NLE categorization was knowledge domain.

A provisional list of domain areas was drawn up by categorizing the NLEs described and analyzed during the workshop (as well as others known by some group members). The areas identified were:

- language learning (Story Maker 2 , Tactical Language Training System, Who is Oscar Lake?, Do You Speak English?, Kar2ouche Composer)
- story creation (Kar2ouche, Teatrix, SAM, TeatreLab, MediaStage, GhostWriter, Imagine, D.FilmMaker)
- social learning and change in attitudes (FearNot!, Carmen's Bright IDEAS, VGAS)
- history and political sciences (Great Alexander - in Greek)
- sciences.

As concerns sciences, no specific examples were mentioned. The group discussed at some length whether it is possible to devise learning environments which are intrinsically narrative for this group of disciplines, or if these fields of study, because of their very nature, allow only marginal use of narrative as a way of "sugaring the pill", that is, to ground experiences to stories and support motivation by creating a more interesting environment, without any real influence at the cognitive level. Both sides of the argument were explored in depth. Although the lack of examples of NLE on science topics seems to suggest that science and narrative do not really fit, some

group members argued that it does not seem to be a conceptual impossibility. An example mentioned was the case of constructive proofs in geometry, where the operations performed can be interpreted as sequences of actions and events having as their agents points, lines, polygons, etc. These elements might play, the role of story characters, it was argued, with the same right as the witches, trolls, etc. of children's narratives. Further investigation and debate is necessary to verify the effective possibility of using narrative as a cognitive support in scientific works, and to ascertain whether there really are examples of TELEs for science.

As concerns the "pill sugaring" function of much narrative used in TELEs, there was general agreement that not all environments which include some form of narrative should be considered as NLEs, but only those where the narrative is strictly functional to supporting the cognitive aspects of learning.

With regard to different ways one can interact with a story within NLEs, four basic roles were identified:

- story authoring
- story telling
- story audiencing
- story experiencing / participating.

Story authoring refers to the creation of a story by a single user or by several users cooperating in the construction of the story. Story telling refers to the narration of a story to an audience in two possible situations: the story can be either invented on the moment by the narrator or can be pre-existing, in which case the narrator contributes to the appearance of the final product by his/her narrative mode and style. Story audiencing refers to a story 'being narrated'. Story experiencing or participating refers to the creation of a story collaboratively by one or more users, each having a different role, as is the case with role play games. A story participant is at the same time author (or teller) and audience, since while he/she is creating (or narrating) his/her part of a story, he/she is audiencing the parts created by the other participants (or narrators).

It is evident that there is a strong interleaving between story telling and story audiencing, not only because there cannot be any telling without an audience, but also because the attitude and reaction of the audience are likely to contribute in some way to shape the way of telling.

As concerns the learning approach that can be embodied in NLEs, several possibilities can be envisaged, most of which are close to a constructivist approach to learning:

- Challenge-based learning / Game-based learning;
- Collaborative / Cooperative Learning;
- Situated Learning / Case-based learning;
- Role Play .

Role play can be characterized as being at the intersection between collaborative and situated learning.

Finally, NLEs can be created through the use of different techniques or technological means, namely:

- 2D graphics /animations
- 3D virtual environments
- Ubiquitous
- Mobile technology
- Augmented Reality
- Intelligent Agents
- Natural Language Processing
- Speech Recognition and generation.

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