The NINF and the teacher: exploring teachers' views of the role of narrative in lesson planning.

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Abstract
The Meno project came up with a framework for narrative guidance and narrative construction in the context of non-adaptive systems. As part of the HOMEWORK project we are exploring the extension of this framework in order to enable us to create adaptive systems that can help teachers offer learners a coherent experience across artifacts and contexts. We are attempting to ensure that the framework that underpins the HOMEWORK project helps designers, teachers and learners to work together effectively. Lesson planning is an important activity for a teacher, which helps them link different educational resources into a coherent narrative. We discuss the evolution of the current Non Linear Interactive Narrative Framework (NINF) and, in particular, our continuing work with teachers as we try to increase our understanding about how best to design a system to support them in their lesson planning activities. Here our emphasis is upon the extension of the Meno framework to the design of a system that can be adaptive to the needs of individual learners and groups.

1. Introduction

There is little argument that as developers of interactive learning experiences we need to consider how best to work with the concept of narrative. When watching someone playing a computer or video game or enjoying a gripping film or play, it is clear that an engaging narrative can motivate people to expend cognitive effort in understanding concepts to which they may not otherwise have been inclined to attend. Indeed it is precisely this effort that learners need to make if they are to understand new material and enjoy success. Failure to attend to narrative leaves us vulnerable to the creation of incoherent or unclear, often boring learning episodes. These, if the listener can be bothered to attend to them at all, will require extra cognitive effort on her part to disentangle the ambiguities and are likely to distract her from the main message of the learning episode and reduce her ability to understand the concepts to be communicated. It is important to note that the situation is more complicated with respect to ambiguity. Ambiguity is not always a negative factor, used judiciously ambiguity can engage learners and cause them to expend effort on learning activities they would not otherwise feel inclined to undertake (Gaver, Beaver and Benford, 2003). It is also clear that what engages one individual may not engage another and that a single narrative may not fit all. The situation is complex and requires us as designers of learning experiences, both system/materials developers and teachers, to consider:

- The narrative we want to present to the learner: the concepts we want her to understand and the possibilities for engagement through ambiguity;

- Her attitudes towards the material and her long and short term motivation
- The process through which she interacts with that narrative in order to construct her own version of it that represents her understanding of those concepts;
- The ways in which we might support her in that process of narrative construction
- The ways in which that learner might interact with others during the process of narrative construction.
- The ways in which all of the above interact with each other.

The HOMEWORK project

We started to try and unpack these factors in a way that would be useful to both designers and teachers in Plowman, Luckin, Laurillard, Stratfold & Taylor, (1999). In the current paper we describe how we are trying to expand this initial framework in order to encompass the development of an adaptive interactive learning resource that must operate across multiple technology platforms and multiple learning contexts. The work we describe is part of the HOMEWORK project in which we are building an exemplar system for children aged 6-7 years, their parents, teachers and classmates at school. It employs an existing set of broadcast video media and associated resources (CDROMs, pdf worksheets and activities) that tackle both numeracy and literacy at Key Stage 1 (4 – 7 years old children). The material will be distributed to set-top boxes (or equivalent) both in homes and school. In the classroom the child will be able to work alone or as part of a group and interact both with a large interactive whiteboard and with a handheld digital slate as directed by the teacher. When the handheld slate is taken home further activities can be completed using a home TV and the slate either working alone, with their family, or with other classmates who may be co-located or at a distance in their own homes. In this paper we discuss the way in which we are working with teachers to expand the framework developed within the Meno project. In particular we discuss how we can use it to underpin the development of the lesson-planning element of an adaptive system and how we can expand the user group to include teachers as well as learners.

2 Background

The original **Non-linear Interactive Narrative Framework (NINF)** was the product of the MENO research project (Plowman, Luckin, Laurillard, Stratfold & Taylor, 1999). It identified ways in which narrative might be exploited in interactive learning environments and distinguished two aspects of narrative:

Narrative guidance (NG)

Narrative guidance (NG): the design elements that teachers and/or software need to provide in order to help learners interpret the resources and experiences they are offered. The framework was built upon the belief that we make sense of our own thoughts and experiences, and those of others through the active generation of narrative: the narrative process allows us to make sense of the world and to share this with others (Bruner, 1996). It also encompassed the view that narrative is a framework within which explorations can occur: a macro-structure with a network of causal links and signposts to inter-related elements each with their own micro-narrative. Within formal education there may be several layers of narrative within these resources. There may be a macro-narrative that is, for example, at the level of a lesson within which there are different elements. This lesson is itself also part of a term's curriculum and therefore in a sense a micro–narrative too. We need to offer guidance to learners and teachers to

help them see the links between the layers of macro and micro narratives as well as to keep track of the individual narrative elements themselves. This guidance needs to be adaptive to the needs of the learner/s, it needs to offer a strong 'storyline' when a learner is new to a subject and then fade as she becomes more accomplished. The important factor here is that the learner/s must participate in the activity of creating the links between the different elements of the narrative.

Narrative construction (NC)

Narrative construction (NC) is the process through which learners discern and impose a structure on their learning experiences, making links and connections in a personally meaningful way. In addition to thoughts about the nature of narrative we were, and indeed still are, influenced by a Social Constructivist perspective upon the teaching and learning process (Vygotsky, 1986). This requires that both learners and teachers are active participants in a process of mediated communication and knowledge construction.

So what does all this have to do with the role of interactive technology? The point about interactive technology is that it allows us to 'play around' with the nature of the narrative guidance we offer to a learner, it allows the learner to be more active in the path they take (or create) through the resources and experiences they are offered. It may also be used to allow teachers to plan and share coherent and individualized learning episodes/narratives with greater ease/more rapidly and incorporating a richer set of media/resources than is possible without great effort. The problem that can arise is that learners (and teachers) have too much freedom to explore and end up being confused and lost. There is a fluctuating tension between the strength of the guidance we need to offer and the amount of control we leave with the learner/teacher. We need to provide them with tools to help them construct their own understanding and free them to explore their own curiosity and to be creative. In order to achieve this we need to understand more about what factors teachers take into consideration when conducting their lesson planning activities.

3. Reflecting on what we learnt in MENO

In order to explore how the manipulation of narrative within multimedia would impact upon a learner's experience we developed a CD-ROM called *Galapagos* about Darwin's visit to the Galapagos islands and his work on evolution. The types of software features that were found to offer Narrative Guidance within this CD-ROM were of two main types:

1. Features of the software that were always available to learners from the navigation bar, such as a menu of contents, textual guide and search facility
2. The nature of the multimedia content itself: (a) Each of the sections of contentful material had its own micro-narrative and its own possibilities for interaction, for example a movie to play or a quiz to complete. Each of these sections had a part to play in the overall story about Darwin's work on evolution. The narrative within these sections was stronger in some cases than in others. (b) The overall narrative that linked these content sections together into a bigger picture: in this case a story about Darwin's work on evolution.

The types of software features that were found to offer scaffolds for the construction of a learners' understanding or personal narrative about Darwin's work on evolution were:

A Notepad facility into which learners were asked to type their answers, a model answer, and a reminder about the task learners were to complete. These were always available as options on the toolbar, although the model answer could only be accessed when learners had started to construct an answer in the notepad.

The key findings from the MENO project that are important in the context of the NINF for the HOMEWORK system are:

1. Simple, clear features that are not necessarily difficult for system designers to provide can make it much easier for learners to understand the concepts being presented. For example, a clear task to complete and a constantly available reminder about that task and any subtasks identified.
2. The nature of the Narrative Guidance provided by a system impacts upon the extent to which learners use the tools available and the manner in which they use them to help them construct their own understanding.
3. What worked for one group of learners in terms of the nature of the narrative guidance provided did not necessarily work as well for another group of learners. For example, the provision of a search and menu but no further guidance about the way the different resource elements relate to each other was fine for learners who were academically able and both familiar and confident with computers. However it did not provide enough support for those who were struggling to make links between what they experience, what they already knew and the understanding they were constructing.
4. The correct balance between the amount of control that a system (or teacher) takes over what a learner is offered and the amount of control a learner has over what they can do is critical to the success of the interaction. For example:
    - Full 'system control', using a defined sequence of material with little optional access to resources will tend to usurp control from the learners to the extent that they play no part in narrative construction at the appropriate level, remaining focused on the detail of the resources. This can however be useful when learners are new to the material;
    - Full 'learner-control', where learners have free access to resources at all times risks incomplete coverage of key material, and, without some guidance, localised attention to resources rather than the higher-level account. This type of approach is more useful with very able learners who are already familiar with the domain;
    - 'Shared control', where learners are repeatedly required to choose between the sub-goals for investigation, is generally more suitable for learners who have some experience with the concepts being discussed, but are not yet confident. This balance between the system and the learner is dynamic and will depend upon the individual differences and previous experience that each learner brings with them to the learning situation.

4. Moving Forward – working with teachers

There are two primary ways in which the NINF for the HOMEWORK system needs to extend these principles developed through the MENO project. Firstly we now need to develop a system that is adaptive to and adaptable by the user. Secondly we need to expand our view of the user beyond that of the learner. For the HOMEWORK system both teachers and also family members at home will be significant user groups for whom we must design. In particular we are not simply designing a system that intends

to offer learners an engaging interactive and televisual experience, we are primarily intent upon creating a system that helps teachers to build engaging interactive and televisual experiences for learners with opportunities for linked activities at home. With much previous multimedia educational technology teachers have needed to invest a great deal of time in order to become familiar enough with the resources to provide the type of narrative guidance needed by learners. One of the aims of the HOMEWORK project is to make the resources as accessible as possible to teachers so that they can link them together appropriately.

This paper concentrates on the teachers and explains how we are addressing the two big questions highlighted earlier:

- How do we adjust the framework so that it encompasses the design of adaptive/individualized interactions
- How do we expand the framework for users other than

As part of the Homework design process we organized a workshop for some thirty local teachers, arranged around four themes, each with their associated set of activities:

1) The Place of Technology
2) Technology and Individuals
3) Technology for linking home and school
4) Technology and Collaboration

For each theme, teachers were divided into groups and asked to explore the preset questions/scenarios, at first individually and then collaboratively and finally to their whole group. The final part of the workshop described above involved a presentation of our current 'scenario' for use of the Homework system from the teacher perspective. This scenario attempts to express our view of Homework as an assistant helping the teacher to develop and deliver individualized coherent engaging learning narratives across school and home. In this paper we concentrate on themes 2 and 4 and their contribution to our exploration into helping teachers design lessons that can be adaptive to the needs of groups and individuals. Under the theme *Technology & Individuals* they were asked to consider issues around choosing a learning activity for an individual child and to think about what they would want to know about that child and which characteristics of the child might influence their choice? They were then asked to imagine choosing a learning partner for the child and to think about what else they would then want to know. Under the theme *Technology & Collaboration* they were asked to think of circumstances in which it was best for children to use TV/Computers individually, in pairs and small groups or as a whole class and think about how computer technology might be used to improve their TV activities. We also discuss some of the reactions to the scenario presented to teachers in the final workshop session.

5. Emerging results

As can be seen from the preceding description the workshop was wide ranging. Teachers also provided feedback on the scenario and system vision both during the presentation at the end of the workshop and afterwards through questionnaires. Reactions to the system proposed were generally very positive with many teachers keen to become involved in trials with the system as we develop it. At first glance these topics may seem to have little to do with narrative. However, the delivery of a coherent

engaging learning experience to individuals is one of the teacher's primary tasks and we see this learning experience as a form of 'narrative'. Our system's goal is to support the construction and delivery of such lesson plan narratives. We are still at an early stage in assimilating and reflecting on the large amount of data captured at the workshop. In the following section we summarize some of the initial findings from our workshop and indicate possible implications for the NINF.

Technology and the Individual Theme

The process of lesson planning

While many teachers felt their preparation would be aided by a database of available lesson plans with links to worksheets and activities, others mentioned the problems of being tied to a computer when planning lessons. Somehow our system should support planning away from the PC. How might one enable teachers to plan at home in front of the TV, out in the garden, on paper and still take advantage of the Homework system? Is being tied to a laptop/tablet/PDA, the same as being tied to a computer? How can the narrative a teacher might construct in her head - engaging, introducing concepts and offering practice and revision be transferred to our system and stored in a format that can be used to run the lesson and shared with others?

The criteria that need to be considered to meet the need of individual learners

Most teachers were very positive about the idea of the system supporting differentiated learning for each individual child and saw it as a way to reduce the current overheads of producing such learning themselves. A system that helped teachers to identify or automatically identified material that both matched objectives for an individual child and also fitted that child's learning history would be well received. Teachers at the workshop identified the following criteria as being those they would wish to take into consideration when planning for the individual learners who would be taking part in any particular lesson:

1. The age of child
2. The child's personality, in particular:
    - ♣ Imagination, Interests, Likes/dislikes, Confidence in speaking, Behaviour, Attitude, Concentration: attention and span, Ability to work independently
    - ♣ Learning style
3. The child's skills, in particular:
    - ♣ Number, Calculating, Spelling , Reading level, Language , Letter recognition/ phonic knowledge
    - ♣ General Ability, Record keeping, Fine motor skills, Social
4. Special Educational Needs, in particular speech /language difficulties
5. Learning intentions from the National .Curriculum:
    - ♣ Subject, Reasons, Outcome, Success criteria, How work will be presented

In addition to this they identified the following factors as those they would need to consider when linking selected activities into a lesson plan. These are pertinent to our formulation of Narrative Guidance within the HOMEWORK system:

1. The teacher's knowledge of the subject area and/or approach
2. The resources available : Artifacts/aids
3. The time available
4. The previous learning of the child in the area

The Homework system, through the NINF, needs to be able to identify and link coherently activities that are appropriate to each individual child. In addition, many

teachers believed it would be useful if the system kept a detailed record about a child's learning activity with information building up over time and interfaces that allow teachers, children and parents to view, review and understand an individual's learning history (in itself a kind of narrative).

The preceding comments are largely relevant to what might be consider a 'macro level' of narrative – the planning of longer periods of learning: a lesson, a term, etc… Some feedback from the teacher workshop was also relevant to the 'micro-narrative', for example within a lesson.

It can be difficult for teachers to keep track of individuals in a class and their state not only over the longer term but also within the 'narrative' of the lesson – Are they engaged? Are they understanding? What kind of intervention is required now? This is perhaps particularly true when individuals are working at different tasks, possibly on computers. Teachers at our workshop liked the idea of being able to view each child's activity 'live' from the teacher's device (PC, PDA, etc…) to check on progress or lack of it. Such a system could flag up extremes of performance or inactivity while children are working in groups or as individuals on computer-based tasks and possibly even suggest alternative activities.

Technology and Collaboration

Much of the learning activity that the HOMEWORK system aims to support will involve classes and small groups as well as individuals working alone. We therefore also asked teachers what factors they would like to be able to take into consideration when planning how children would be grouped when using the HOMEWORK system. It is important that we design the HOMEWORK system so that it engenders collaboration between individual learners in groups to support their co-construction of learning narratives.

1. Personality
   - ♣ Dominance, Independence, Co-operation skills, Confidence, Motivation
   - ♣ Ability to share or help others, Creativity, Emotional maturity
2. The children's friendship groups
3. The children's ability. Some teachers favoured selecting same ability pairings whilst others would prefer mixed ability pairings.
4. The gender of the children involved. As with ability, some teachers favoured selecting same gender pairings whilst others would prefer mixed gender pairings.
5. The nature of the learning outcome that is wanted from the activity?

Once again teachers also felt that a historical perspective would be useful and wanted to know if particular pairings had been successful in the past. They also pointed out that there might be some need to pre-brief the children about the types of collaborative skills they would need in order to complete the activity successfully. This would need to be built into the lesson plan in order to ensure a coherent experience.

General Comments on our Proposed Scheme

A typical concern expressed by several teachers was the issue of not encouraging children to watch too much TV/video by using it in the classroom. In part this may have been a reaction to an over emphasis of the technological aspects in our

presentation. However, many teachers also cited the highly engaging and motivating nature of appropriate high quality televisual material. A related issue was that many teachers felt that activities that could be done in class, such as comparing the mass of objects, were best 'done' rather than 'seen' on TV whereas other more abstract concepts might be better presented through TV and/or interactive media. It was also clear that some teachers felt the preparation and delivery of a coherent lesson integrating short clips of video and interactive activities along with more traditional primary classroom activities would be too difficult and time-consuming – certainly to do on a regular basis. The homework system clearly needs to help alleviate this burden. One way of doing this is to provide pre-prepared 'engaging and coherent learning narratives' that link pieces of TV media, paper-based activities, songs, interactive multi-media. But who will author these?

Some producers provide resources (e.g. The Number Crew), which include TV, multimedia, physical activities and lesson plans that integrate these. However, it was clear from our workshop that teachers need to be able to adapt learning material to their own classes and their own individual styles. And that teachers are prepared to spend some time adapting materials and sharing these. An implication for the Homework system is that as well as providing access to ready-made narratives it should allow and in fact help teachers to adapt and expand on these and to share these variations with colleagues. A further implication would be that the system should help and guide teachers in finding and incorporating alternative activities and media for use in learning episodes that both fit the teacher and learners' requirements and the 'narrative' of the particular learning episode/lesson.

6. Concluding Remarks

The primary goal of the HOMEWORK project is the creation of a system that helps teachers to build engaging interactive and televisual experiences for learners with opportunities for linked activities at home. To assist us in this endeavour we are extending the Non-linear Interactive Narrative Framework previously developed as part of the Meno project with a particular focus on the development of an adaptive system. Indications from our 'teacher workshop' are that guidelines arising from such a framework could provide guidance on how such 'narratives' can be adapted, either automatically by a learning environment, by a teacher or indeed by the learner, to suit individual needs and interests. We also need to consider how the NINF can support monitoring of individual learning narratives providing perspectives both at the macro level (a child's history of learning interactions – possibly over years) and at the micro level (what is happening now for this individual at this moment in a live narrative). Such perspectives also need to be adapted to the viewer – a teacher monitoring and responding to several individuals in a class, an individual inspecting and making sense of his own learning, a parent trying to understand where their child is in her learning.

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