Narrative and Constructivism in Cyberspace: Instructional Design for Distance Delivery using Hypertext on the Internet

NICK ZEPKE
DEPARTMENT OF EDUCATIONAL DEVELOPMENT
WELLINGTON POLYTECHNIC
WELLINGTON

EDUCATORS can only watch with awe the spectacular developments in information technologies. Hypertext could yet realise the vision that learning is learner controlled. World Wide Web sites on the Internet give learners access to a whole world of learning opportunities. In short we can now conceive of abandoning instructional design which is focused on teacher as centre and student as margin, hierarchy and linearity in favour of design based on multilinearity, student control and world wide networks. Even technosceptics, and I am one, must admit to the potential.

Distance delivery in particular has benefited from hypertext and the Internet. The potential of these media encouraged Wellington Polytechnic to start Project Hydi (Hypertext in Distance Education) Its Bachelor of Education was the Polytechnic's first programme to navigate in distance education cyberspace. A sampler has been completed and the process of developing courses has begun. But poorly designed courses are poor no matter how exotic their delivery. So the Project Hydi team has undergone a crash course in instructional design for distance delivery using Hypertext and the Internet.

Conventional instructional design theories and practices were examined first. The emphasis here seemed to be on structure: predetermined learning outcomes; the dominance of content over process and teacher ordered and controlled delivery (Sylvester and Hunter-Reid, 1996; Print, 1988; Gonczi, Hager, Oliver, 1990; NZQA, 1991; Golby *et al.* 1981). But an emerging literature on instructional design for the Internet pictured a different instructional process. Here students were to be in charge. Using the vast knowledge reservoir of the Internet and the flexibility and interactivity offered by hypertext, students learn through discussion and creation of their own knowledge (Nix and Spiro, 1990; Eraut, 1993; Latchem, 1993; Crook, 1994; Mason, 1994).

Never enchanted by binary opposites like these, the Hydi team saw the necessity of both teacher narrative and student construction of knowledge in designing distance education using hypertext. For the writer, a member of the Hydi team, the most important source for a working synthesis of these positions was attendance at a 'face-to-face' conference: the Association for the Advancement of Computing in Education (AACE) World Conferences on Multi and Hypermedia and

Telecommunication (1996). Over 30 papers and numerous discussions enabled me to develop a working model for instructional design for distance delivery in Hypertext and the Internet.

In getting to the model, I first note some dominant themes relating to concepts about instructional design on the Internet. Then, in a series of recommendations I outline the practical implications of the emerging model.

Towards a View of Instructional Design on the Internet

Six broad statements capture my emerging concept of instructional design for learning and teaching on the Internet. Each is made up from the ideas and research presented in key conference papers.

1. Teaching with hypertext, like all teaching requires a strong 'narrative' line. Narrative carries key content concepts in an orderly fashion. Concepts are organised and sequenced by the teacher.
2. A number of teaching/learning tools enables instructional designers to fashion and sustain a logical narrative line.
3. The whole point of hypertext, however, is that it enables students actively to construct knowledge and their own learning paths to that knowledge.
4. Competent hypertext instructional design balances an orderly narrative controlled by the teacher and the construction of knowledge controlled by the learner.
5. A number of teaching/learning tools enable instructional designers to achieve and maintain this balance.
6. Design balance is the overwhelming message from the conference and forms the key assumption for the emerging model.

The Importance of Narrative Line This was a constant theme. Bielenberg and Schnieders (1996) , Zeiliger (1996), and Delouis (1994) all built their messages on the need for hypermedia teaching to include a strong narrative line organised and sequenced by the teacher. Bielenberg and Schnieders offered 'story' as the engine for narrative. Zeiliger emphasised concept maps. Delouis offered the concept of 'total knowledge', which includes the ability to transform simple perceptions of many distinct knowledge objects into one single abstract narrative. Mohl (1996) just worried that without narrative, the medium (the Internet) would outstrip the message (content) in importance.

It was Laurillard (1996), however, who argued most cogently for the necessity of narrative line in hypermedia teaching. She offered Meno's paradox to explain the danger of offering too much choice to learners. 'How can you learn something you know nothing

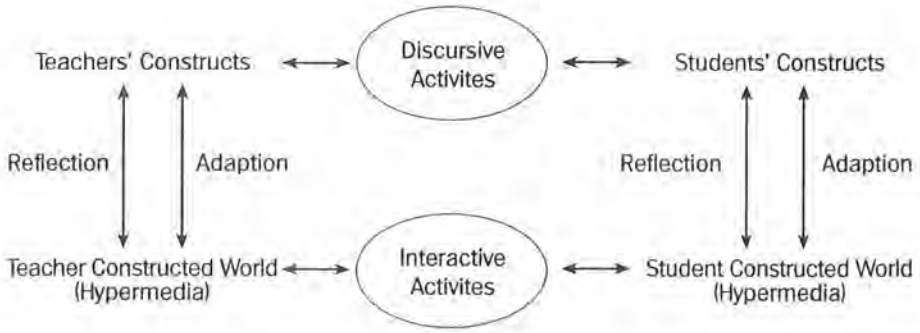

Figure 1. A model showing relationships between discursive and interactive learning in hypermedia

about?' A Pandora's box of options and interaction, hypermedia, in fact, threatened a 'tyranny of choice' for learners. Narrative provides structure for students. She explained this point via a learning model. In any teaching situation there are teachers and students. Teachers have their own constructs. Through reflection and adaptation, teachers construct a world. Students similarly construct their world from reflective and adaptive processes. In a teaching situation two processes link teachers and learners: discursive action, such as teacher explanation, and interaction, such as discussion and research. Hypertext tends to emphasise interaction between teacher and student, student and student or student and materials while ignoring the discursive side of the teacher-learner equation. She has a visual representation of her learning-teaching model. The discursive activities are narrative in nature. They give structure and content and motivate many learners to carry on learning.

TOOLS FOR MAINTAINING NARRATIVE LINE I came across five tools which will help hypermedia instructional designers maintain a strong narrative line. They are: repeated references to learning outcomes, cultural contextualisation, story, concept maps and knowledge building.

LEARNING OUTCOMES Laurillard (1996), Collis (1996), Carver *et al.* (1990) and Reeves (1996) all referred to the importance of explaining regularly, referring to and evaluating learning outcomes. This orients the learner to what is to be achieved, is being achieved or has been achieved. Laurillard also suggested that Learning Outcomes should be accompanied by prerequisite knowledge, skills and attitudes for stated learning outcomes, some guidelines as to how important each learning outcome is (time needed, for example) and also how projects and exercises are related to learning outcomes.

CULTURAL CONTEXTUALISATION Henderson (1996) works with Aborigines and Torres Strait Islanders in a hypermedia distance teacher education programme. She adopts Vygotsky's view that people's potential development is determined through problem solving with guidance from and in collaboration with more capable others (teachers?). This implies that instructional design carries strong narrative. However, students are different. They perceive the world from many different perspectives. These may be generalised as cultural perspectives based on gender, ethnicity, class or institution among many others. So the narrative line must relate to the different cultural contexts. If it does, instructional design will be multiple cultural, not multicultural. Henderson admits that this is difficult to do, but offers what she calls the inverted curriculum as a possible approach. This means that as parts of the narrative line the teacher includes material from multiple cultural perspectives. It also means that healthy doses of critical theory and postmodern discourse are included.

STORY Bielenberg and Schnieders (1996) and Bielenberg and Carpenter-Smith (1996) offer another perspective on narrative in hypermedia teaching. They argue that the narrative in a programme can be shaped just like a story, through 'the intentional use of key elements of story structure - action, character, conflict, genre'.

While Bielenberg *et al.* use story in a case study format, it is not necessary to confine it to this. Story is found in any narrative and can be grounded in theory. The work of Kuhn as it applies to education can be told in story form, for example. The anomalies and puzzles experienced in a troubled paradigm can be expressed in actions. Attackers and defenders of paradigms can be written as characters who interact in the story. Because paradigm wars are big on conflict, opposing views can be expressed very dramatically. Even in story form, the drama of paradigm change must meet basic academic criteria. These define the academic genre.

Stories seen in this eclectic light can be motivational, problem setting and interactive. Above all they provide the teacher with the opportunity to introduce and maintain the strong narrative line called for by Laurillard.

CONCEPT MAPS It must be admitted at the start that the research reported by Zeiliger (1996) did not show that students using concept maps for hypermedia learning did better on post tests than students who did not use such maps. Nevertheless, it appeared to me that concept maps are useful tools in establishing and maintaining a narrative line. Zeiliger based his concept maps on three components: upper level concepts, contributing concepts and the creators of concepts. Students could click on to any of these components and navigate from there. Starting points seemed to depend on whether students liked an inductive approach (contributing concepts to learning), a deductive approach (upper level concepts), or a people centred approach(creators of concepts).

KNOWLEDGE BUILDING To some extent this label is more appropriate for a discussion of constructivism, than a description of a tool for maintaining narrative, which is essentially knowledge representation. Nevertheless, Delouis' (1996) work with brain traumatised patients suggests that narrative also contributes to knowledge construction by students.

She described a four-part process of 'knowledging' for achieving something she calls 'total knowledge'. Total knowledge is both functional and subjective. The knowledging process always involves functional knowing first, then subjective knowing. It also always involves associating new knowledge with existing concepts or experiences.

Meno's paradox suggests that functional knowing is difficult to guarantee without teaching. Similarly a teacher can more easily stimulate associations than can the student working alone. A narrative line which includes references to the practical uses of a concept or process taught, and guides students through a process of concept association, will help a student journey towards Delouis' state of total knowledge.

CONSTRUCTIVISM AND KNOWLEDGE CONSTRUCTION Laurillard and friends, however, camp in the hypermedia virtual desert. Educational media enthusiasts see hypermedia as the opportunity to revolutionise education. According to them it empowers students to construct their own knowledge. Boyle outlined the principles of constructivism as follows:

- construction of knowledge rather than instruction
- learning tasks should be authentic not artificial
- learning takes place in a social context and is by nature collaborative
- students have both voice and ownership in the learning process
- students must draw on their experiences in the knowledge construction process - not only on facts
- students must awaken to their part in the knowledge construction process

Taken to extremes this line of reasoning leads to solipsism: all knowledge is internally generated by individuals, not generated by external sources. Most hypermedia educators seem to take a more modest view. Nevertheless, they would follow Bos, Kikstra and Morgan (1996) in arguing that sound instructional design for hypertext emphasises activity, knowledge construction tasks, collaborative learning, interaction and conversation, context and reflection.

What does a constructivist approach to hypermedia learning look like in practice? According to Lynn (1996), a practical 'real life' project is central. This must enable the student to build knowledge obtained from evidence obtained from teacher references or captured by surfing the Internet. Evidence

should be discussed in groups, so some kind of interactive forum should be provided. The forum must allow for critiquing and adapting existing information and models. Completed projects should be hung out on the Internet so that they may be critiqued in an open way. Whether criticism is by the general public or other students depends on the level of study. Guidelines may be provided by the teacher as to what kind of comments is appropriate. Lynn, who is associated with a major science project, suggests that student propositions, ideas, proof, argument and rebuttal should be critiqued by peers and teacher. This project based approach helps students to be critical of the rubbish that inhabits the hyperworld. It prepares them for lifelong learning.

Collis (1996) also suggested that a social constructivist approach to hypertext design be built around a real life project. She prefers to give projects to groups rather than individuals. Each group member is expected to bring a specialism to the project so that in completing the project, the group completes a jigsaw puzzle with each piece an individual's contribution to the whole. The project may take as much as 70 percent of course time. Students' work is supported by news groups, one on one communications with students and teacher, testing and even presentations by the teacher. Collis has her class complete a course book each year of the principles learnt. This book is 'published' on the Internet as critical testimony to the learning achieved.

Dainty, Keeling and Jones (1996) argue that hypermedia is excellent for motivating both intrinsic and extrinsic learners. Intrinsically motivated learners respond to the empowerment and creativity provided by project work and the feedback provided by news groups and instructors. Extrinsically motivated learners respond to the rewards and fun of hypertext learning. They do warn, however, not to 'Disneyfy' the learning process as reliance on novelty factors leads to short term motivation.

But does constructivist hypermediated learning suit all kinds of learners? Reed (1996), Ellis (1996), and Rasmussen and Davidson (1996) all reported on Learning Style research. Reed reported on a number of projects testing students on the Kolb Assimilator, Accommodator, Diverger, Converger inventory. He reports that no significant differences were found in achievement in hypertext usage. There is some difference, however, in the way students use hypertext. As can be expected, divergers tend towards non-linear use of hypertext; convergers were more reliant on linear, teacher constructed knowledge. Accommodators were slightly more content to construct knowledge than assimilators. Ellis and Rasmussen and Davidson reported similar non-significant results for the Kolb inventory.

Reed (1996) also reported on some testing with the Group Embedded Figure Test (GEFT). Again no significant differences were found between Field Dependent and Field Independent learners. Both performed equally well, although Field Dependents' approach was more linear and they learned to greater depth than Field Independents. One study found that Field Independents out-performed their opposites slightly. My conclusion is that all kinds of learners can work successfully in a hypertext environment.

Achieving a Balance between Narrative and Knowledge Construction

Clearly there is a tension between narrative and knowledge construction. The instructional designer needs to find an appropriate balance between the two. Reeves (1996) offered a learning design model which he thought might balance the two. His is a simple systems model. It defines a number of inputs brought by the student to the hypertext learning situation. These include:

- cultural habits of mind which originate in the context in which the student lives;
- learning aptitude based on individual learning styles, abilities, experiences;
- whether motivation is extrinsic or intrinsic.

The model also specifies a number of outputs which I would call learning outcomes. These, according to Reeves, include:

- knowledge and skills;
- mental models of the world constructed by the student;
- identification and solution of previously ill-defined problems;
- intellectual curiosity;
- lifelong learning.

Instructional design links student inputs with learning outcomes. Reeves offered six dimensions as links. They were:

- students should have the opportunity to construct their own learning;
- they should have ownership of the project or task;
- they should have a sense of audience; the opportunity to receive feedback from the whole of the Internet world;
- tasks and projects should be done collaboratively;
- the teacher's knowledge and experience should structure the learning experience;
- literature, other people's work, teacher's notes should be available at all times.

Diagrammatically Reeves pictured his model as follows (Figure 2).

Laurillard offered a less elaborate but similar model for achieving the balance. She argued that hypermedia instructional designers need to have students

- discuss by attending to and articulating information which allows knowledge to be constructed;
- act to achieve specified learning outcomes by receiving and giving feedback;
- adapt knowledge and modify action in accordance with feedback;
- reflect on, evaluate and synthesise both received and constructed knowledge.

Further Tools for Balancing Narrative and Knowledge Constructs

I have argued that hypermedia instructional design should balance narrative and knowledge construction. Reeves and Laurillard offered fairly generalised techniques for achieving this balance. The conference offered two further balancing ideas.

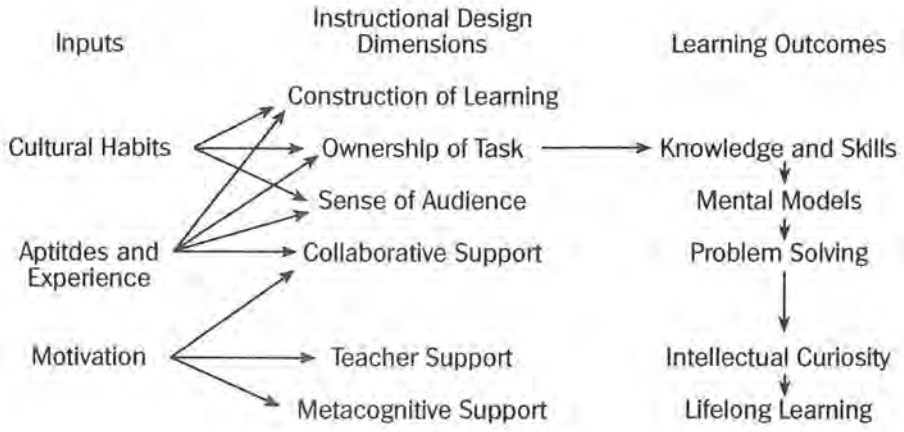

Figure 2. A model for achieving 'balanced' hypertext learning

Designing for Learning Style

Carver, Howard and Lavelle (1996) discuss adapting hypermedia to suit different learning styles. When students log in to begin a lesson, they are given the opportunity to explore the course material according to their learning style. Carver *et al.* use Felder's Learning Styles. Felder deals with five dimensions of learning: sensing/intuitive; visual/verbal; active/reflective; and sequential/global. Their course material attempts to match teaching to learning style preferences. Certain media is inherently appropriate to different learning styles. For example, their material includes slide shows, graphics and digital movies, features designed to appeal to visual learners who can focus on this aspect of teaching material. Carver *et al.* concluded their paper by claiming that adaptive hypermedia based on student learning styles provide the ability to tailor individually the presentation of course materials to each student.

Designing for an Inverted Curriculum

I have already reported Henderson's contention that teaching in hypermedia should be multiple cultural, rather than multicultural, and include material from the perspective of different cultures. Such cultures may be based on ethnicity, gender, institution, academic discipline or dominance. The model is multiple cultural because all these cultural types are treated from the inside by the instructional designer. When multiple cultural learning is facilitated and/or led by the teacher, a strong narrative line is introduced. When students lead, social constructivism dominates. This balance is further enhanced by critical theory which critiques all constructions. Henderson's model offers a design paradigm which reflects society's multiple realities, incorporates various ways of learning and teaching, and offers a critical dimension whether narrative teaching or constructive learning is occurring.

Towards a Working Model

The foregoing discussion suggests that distance education on the Internet should aim for balance between organising narrative and student construction of knowledge. To achieve this, I offer the following design guidelines for discussion.

1. Design courses around 'real' problems to be addressed through 'real' projects; allow students to explore given hypertext links and discover new ones; set problems which allow them to establish new meanings and understandings.

2. Define problems in terms of learning outcomes; ensure that outcomes define both ends and means of the project and so offer guidelines for the learning process; support learning outcomes with concept maps to act as learning signposts.

3. Provide supporting resource material in the form of stories, teacher notes and site addresses to allow necessary connections to be made; connect students to other students though bulletin and news boards.

4. Use an instructional design which allows students to navigate according to their learning style preferences. Try to cater for at least three different learning styles - preferences for sequential narrative learning; preferences for global; and intuitive learning preferences for self-planned learning

5. Use projects which enable students to explore multiple cultural contexts which give rise to critiques of their own as well as other contexts. Where possible, have students do this in groups to enrich their experiences.

6. Publish finished projects on the Internet to lend them authenticity and give students a sense of audience for their work. Safeguard students from unsafe criticism but ensure that work is critiqued.

7. Do not use hypertext as the sole delivery option. Supplement hypertext programmes by classroom sessions, computer mediated communications (CMC) or even readings.

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Nick Zepke *is Head of the Department of Educational Development, Wellington Polytechnic, Private Box 756, Wellington.*