Student Hypermedia Composition

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Discussion Schedule
Discussion: 29 November - 8 December 99
Summing up: 9 - 10 December 99

Pre-discussion paper

A number of researchers (Landow 1997) (Bolter 1991) (Tuman 1992) have indicated that epoch-making changes have for some years been occurring in the writing practices enabled by digital technologies. Francisco Ricardo (Ricardo 1998, pp.142-144) identifies the 'hypertext link' as the defining feature of a 'new grammatology', which has signalled the arrival of what he terms a 'third epoch of writing' in western civilisation, following epochs one and two of, respectively, 'token and archaic writing' and 'sequence and modern writing'.

Factual evidence of a widespread growth in the use of email and HTML documents on the internet (NUA 1999, p.1) gives some credence to such apparently extravagant speculations that a major global change in writing practices is currently occurring. In view of this proliferation of e-communication, it is possible that we are currently on the wave of a radical realignment of writing processes, in the adjustment from print-based to on-line virtual environments. These speculated changes include, but are not limited to, concepts of the visualisation of literacy (Kress, 1996, pp.15-16) (Kress 1997, p.6) (Tuman 1992, pp.109-138) . They also include the idea that an awareness and understanding of the 'multimodality' of communicative competence, and the 'ability to cross modalities' (Street 1998, p.15) are now of key importance in education (Kress 1997, pp.10,99,154). In a newly wired world, multimedia incorporates sound and motion, as well as the visual, into the 'many modes' of 'synaesthetic' writing (Kress 1997, 38-43) (Bolter 1991). How far, and where, these changes will take us is not yet clear.

At this time, therefore, it seems particularly important that educational institutions take up the challenge of enabling students to acquire skills in communicative competence in learning about hypertextual multimedia. And also in learning 'how to not take things at face value', by analysing what Brian Street refers to as the 'often hidden processes' of the 'new communicative order' (Street 1998, pp.9, 22). Enabling students to develop their own, local, self-generated meanings using new technologies, as well as critically evaluating the works of others, is crucial, since power resides in the fluent use of these 'new literacies' (Street 1998, pp.1, 22-23). Paramount amongst the skills for using digital media effectively is the ability to author hypermedia.

Whalley cites the 'oft repeated truism that the best way to learn something is to learn how to teach it', or, 'to turn the computer over to the learner as a device for expressing and exploring their own ideas' (Whalley 1995, pp.201-202). Student authoring in hypermedia can be a uniquely productive process, as Lehrer (Lehrer 1993) and others (Hay 1994) (Turner 1992) (Wray 1994) (Jonassen 1996) have observed. Just as written composition can enable students to develop 'knowledge transforming' (Bereiter 1987, pp.10-12) skills, so can the environment of hypermedia be used to facilitate self-empowerment through an increase in students' expressive and problem-solving capabilities.

Placing learners in the role of *'designers'* of hypermedia (Lehrer 1993, pp.197-201) (Sharples 1996, pp.135-137) can engage them in developing a range of skills, including skills in project management, research, organisation and representation, presentation and reflection (Jonassen 1996) (Carver 1992). Jonassen and Reeves advocate 'the use of hypermedia as a cognitive tool' (Jonassen 1996, pp.693-715) in realistic contexts that enable students to learn *with* technology in a constructivist sense. Their findings that '(1) learners develop critical-thinking skills as authors, designers and constructors of knowledge and (2) learn more in the process than they do as the recipients of knowledge prepackaged in educational communications' (p.713) provide a challenge to researchers to engage students more systematically in authoring their own works.

Wray, Chong, Phillips, Rogers, Walsh and Laird (1994) note that there has been a general disinclination to carry out research on student hypermedia authoring, partly because of the difficulty of learning hypermedia programming languages (Wray 1994). However, these researchers comment that more user-friendly HTML software development now enables complex hypermedia documents to be authored with little or no knowledge of programming languages. Therefore, student document creation in hypermedia has become a real possibility across the curriculum for non-computing students. Since this field is so relatively new, there is a need for a development in understanding by teachers of the level of difficulty faced by novice students attempting to author their own compositions, and the factors necessary to create productive learning situations.

Questions for the Forum

One of the debates encompassed by the recent IFETS discussion on programming is: to what extent is there a value in enabling students to use 'point and click' authoring programs (Belzano 1999)? Do applications like *HyperStudio* have too low a ceiling of learning for students to benefit from their use (Belzano 1999)? Or - is the main issue the idea that icon-driven 'point and click' authoring environments 'put the control of the student's learning environment into the student's hands', by enabling 'ownership of the learning'? Is this 'what makes these technologies powerful' (Nanlohy 1999)' ? Can user-friendly hypermedia applications be applied, thoughtfully, to encourage students to develop skills of authoring and critical analysis in digital media, equipping them for the major changes in on-line virtual learning currently occurring, or do they encourage a bland superficiality?

These questions relating to student composition in hypermedia were put to the forum.

Pre-Discussion Posting

The IFETS discussion on Student Hypermedia Composition was prompted by the idea that developing students' own hypermedia authoring skills, using software which is relatively easy to learn, can be a productive enterprise, particularly at a time when an increasing global emphasis on online multimedia literacy makes it perhaps ever more important that students in general across the curriculum are able to write and analyse in digital media. For the benefit of those unable to examine the pre-discussion postings, some brief extracts of the pre-discussion ideas of forum participants on the subject for discussion were attached:

Pre-Discussion IFETS Postings on Student Hypermedia Composition

Michael Punches (14th November) asked for details of articles or websites to prepare participants for the discussion on student hypermedia composition. Three initial references from researchers who have worked directly with student composition in hypermedia/multimedia were selected from the bibliography and attached. A range of other useful sources of information were offered for any forum participant who would appreciate this.

Hay, K. E., Guzdial, M., Jackson, S., Boyle, R. A., and Soloway, E. (1994). Students as Multimedia Composers. *Computers in Education*, 23 (4), 301-317.

Lehrer, R. (1993). Authors of Knowledge: Patterns of Hypermedia Design. In S. P. Lajoie & S. J. Derry (Eds.) *Computers as Cognitive Tools*, Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc., 197-227.

Turner, S. V. & Dipinto, V. M. (1992). Students as Hypermedia authors: themes emerging from a qualitative study. *Journal of Research in Computer Education*, 25, 187-199.

Crispin Weston (25th November) told the forum about some useful experiences of using hypermedia authoring in "a History project for 15 year olds" in creating a presentation arguing for against a proposition about the First World War. Crispin advised that "The main learning benefit... was that it helped teach the basics of organising an argument .... What was particularly important was the linking of argument with evidence. Getting the students to construct diagrams of their project gave a very concrete way of visualising the argument. This becomes particularly true when there are complex inter-relationships between different parts of the argument."

Crispin felt that "the project was very successful at introducing the idea of elementary essay structure", but doubted "hyper-media's potential for conveying complex argument, which generally requires disciplined,

purposeful, sequential thought. Hypertext's scatter-gun approach generally gives a rather superficial coverage of the topic. It may very well encourage lateral thought ... But in this role it is the Roget's Thesaurus of thought: a useful mind-jogger - but not likely to break down any big intellectual barriers."

Dr Muhammad Betz (26th November) said of *HyperStudio*, following information in Crispin's posting that files may become lost, "I don't find HyperStudio … too flakey … a program, per se," and reminded us of the practical point, "regarding the problem of losing files: be sure to do most of the writing and saving to a copy of the file stored on the hard drive. If a floppy disk is used for continual re-writing and updating, the file soon becomes corrupted and "lost." Use the harddrive for the bulk of the work and then use the floppy for portability (better yet a zip disk.)"

Dr. Eric Flescher (26th November), also in response to Crispin Weston's posting, said that he did not particularly find *HyperStudio* "flaky" to use, and that students were able to pick up the basics in a few hours. He thought that "It may have been more effective if the students combined together to first put together a stack on the situation/event . Those arguments … could then have been linked to the main stack." Dr Flescher thought that " there should have been more focus on making their argument via
(1) text
(2) pictures and graphics
(3) sound
(4) pop up windows
(5) other features."

Dr Farhad Saba (Sat 27th November) put forward an interesting response to the pre-discussion paper, saying, "My approach to teaching hypermedia has lead me to approach it from a post-modern theoretical point of view, and ask students to use "deconstruction" as a technique for using hypertext." Dr Saba asked: "I wonder if anyone else on this discussion is using post-modern theory as an approach to teaching hypermedia and multimedia?" and noted that 'More user friendly software, therefore, has helped my students to concentrate on "opening the text" rather than wrestling with the software."

Frank James (27th November) appreciated Crispin Weston's "nicely illustrated" posting of 25th Nov about hypermedia, saying, "I would like to read about the similar/dissimilar experiences of others."

The range of references and issues above were posed as pre-discussion items to the forum.

Post-discussion summary

The formal discussion on Student Hypermedia Composition (29 November - 10 December 99) consisted of contributions made by Crispin Weston, Jan Sjunnesson, Anthony Stenton, Sandra Goetze, Dr Farhad Saba, Frank James, Dr M Goswamy, Dr Muhammad Betz, Dr Eric Flescher, Ly Syin Lobster, Rick Parkany, Benjamin Choppy, Dennis Nelson, Westley Field, Meropi Hatzivei, Dennis Nelson, John Sechrest, Glenn Ralston, Margaret Farren and myself as moderator and summariser.

Although several other discussions on other subjects were taking place simultaneously in the Forum, the four summaries posted at various stages in the discussion specifically confined themselves to those comments posted on the debate on student hypermedia composition. All contributors throughout the formal discussion period were thanked for their contributions.

Questions for the Forum Following the First Summary

From the main themes emerging in the first phase of the discussion, some initial pointers to the discussion were posted:

1. Is the "main learning benefit" of working with students in hypermedia that it can help "teach the basics of organising an argument? How far do you think that hypermedia enables this? Or not?

2. In what way do you feel students can be "designers of knowledge" when using hypermedia? What does "designers of knowledge" actually mean?

3. What kind of teaching support should there be available for students learning hypermedia? How could one help students to use such support to become more independent learners?

Main themes emerging overall from the discussion were the following:

Time-consuming Management of Student Hypermedia Production

Dr Goswamy (27th Nov) raised the issue of whether "the teacher ends up paying much more personal attention to details (which otherwise the students would have done by themselves) and thereby contributing directly to the quality of the end-result". Crispin Weston (30th Nov) agreed that this was "a dilemma" but noted that "it is a problem largely within the teacher's control as to how much direct assistance you give to the student". Crispin advised that a questioning attitude could be applied, and that personal tuition to students could be "very stimulating", resulting from thoughtful student queries about the project in hand.

Students as Users Vs Designers of Hypermedia

Crispin Weston (30th November) commented on Dr Goswamy's points (27th November). Dr Goswamy had said that students could "run-off" the topic of a hypermedia project, losing their focus. Dr Goswamy felt that this characteristic of hypermedia could result in "less motivated" or less "disciplined" students. Crispin commented that he agreed with this in terms of "students as users of hypermedia", but not when "students are put in the role of designers of hypermedia".

Doubt about Hypermedia's Potential for Conveying Complex Argument

Crispin Weston (25th November) had earlier written on "the main learning benefit" observed when doing a History project with hypermedia, which was "that it helped teach the basics of organising an argument" ... "the project was very successful at introducing the idea of elementary essay structure". Crispin noted, however, "hyper-media's (lack of) potential for conveying complex argument, which generally requires disciplined, purposeful, sequential thought", saying its "scatter-gun approach ... generally gives a rather superficial coverage of the topic", and that hypertext "may very well encourage lateral thought, which can be useful when one is lacking direction, particularly at the beginning of a project looking for leads ... in this role it is the Roget's Thesaurus of thought: a useful mind-jogger - but not likely to break down any big intellectual barriers." Crispin noted: "perhaps the greatest educational benefit of using hypertext is that it offers quick reference to students who are too lazy to use a dictionary or index."

Reading Hypermedia gives Students a Stimulating Overview of Research

Anthony Stenton debunked the concept that "hypermedia promotes superficial thought", saying that this was "merely prejudice" and that the "association of hypermedia with lightweight lateral thinking and paper-based documents with rigorous purposeful sequential thinking is bogus. He commented that "hypermedia documents are ideally suited to giving students a stimulating overview of research projects within a given field .... a reading activity which is still vastly under exploited in the field of education". Anthony noted that in Toulouse University, "10 years experience with hypermedia for language learning has shown that reading concentration improves considerably."

"Deep" vs. "Shallow Hypertext Re. Dictionary References

Crispin Weston (30th November) distinguished between "deep" versus "shallow" hypertext in considering the comments made by Dr Goswamy about hypermedia providing "quick reference to students who are too lazy to use a dictionary". Crispin defined "shallow" usage as, for example, "pop-up references, rather than full-blown navigational links", and felt that it "is potentially very useful in education, even if this potential is often unrealised". By contrast, "deep" usage would be full navigational linking, which Crispin identifies can lead to "the full-blown experience of errantry which is both the charm and the curse of hypertext proper". Crispin agreed

with Dr Goswamy about the potential for confusion of the latter, but felt that the "look-up" usage of "shallow" hypertext was not so confusing.

Problems/Benefits for Adults using Hypermedia-based Lesson Delivery

Dr Goswamy wrote (27th November) that the main problem for adult learners in using hypermedia-based lesson delivery was 'that of "discipline" and the "(comparatively greater) time required by adult learners to actually develop the topic under discussion and the increased attention required by the teacher (if present) in keeping the learner on track".

Dr Goswamy noted that by "using hypermedia I feel the learner learns 'much more of everything' and if proper 'training in use' of the media is provided can become a much better independent self-learner. The expertise gained by using hypermedia in analysing secondary data, the self-imposed discipline in restricting one's activity and thought to a focussed theme and presenting the analysis concisely helps the student in real-life situation".

User-friendly Hypermedia Applications and Postmodern Theory

Dr Farhad Saba (27th November) picked up on the pre-discussion paper by noting that "My approach to teaching hypermedia has lead me to approach it from a post-modern theoretical point of view, and ask students to use "deconstruction" as a technique for using hypertext". Dr Saba noted that "more user friendly software ... has helped my students to concentrate on "opening the text" rather than wrestling with the software".

Sandra Goetze (29th November), responding to Dr Saba, noted that from a recent "discussion of postmodernism and hypertext" she had a useful chart which "juxtaposes linear and nonlinear text with a backdrop of postmodernism". Sandra is "using postmodern approaches with preservice teachers to help them conceptualize their use of hypermedia when creating electronic portfolios for children" and also working with both the students and the children "to use hypermedia as a tool to juxtapose different texts to express their newly formed intertexual ideas", for example in "the use of critical literacy themes".

Jan Sjunnesson (29th November) also commented on this theme, referencing Sherry Turkle, the debate of postmodernists and psychoanalysts and "ethnographic/cultural studies of computing and use of IT".

Software and File Saving problems

Crispin Weston noted (25th November) that "the software [HyperStudio] appeared to be a bit flakey and a number of students lost their work. Both Dr Flescher (26th Nov) and Dr Betz (26th Nov) responded to this, neither finding that *HyperStudio* was "flakey". Dr Betz gave practial suggestions for avoiding the loss of files, e.g. by saving things to a hard drive rather than a floppy.

Distance Learners and the use of Hypermedia

Dr Goswamy (1st December) commented on Crispin Weston's "convincing and relevant" reply to some of his earlier points, bringing the focus of the discussion back to his experiences with distance learners using hypermedia. Distance learners of necessity do not have the same access to assistance from a classroom teacher, but tend to "come to the f2f sessions with accumulated questions and problems". Dr Goswamy's experience of observing these face to face sessions echo Crispin's experience of being "rushed off my feet" as a teacher of hypermedia, in a situation in which the "personal tuition that the use of the computers demanded" was "often very stimulating". Therefore, Dr Goswamy feels that "the teacher's input in this situation has to be highly professional", and unfortunately "most teachers lacked necessary skill".

Commenting on the "deep"/"shallow" distinction Crispin had made about hypertext, Dr Goswamy noted that distance learners often lost their way in their self-study, and adult learners in particular needed "some way to sensitise" them to "explore" until they reached the "depth as may be necessary" for the student's level, in order to avoid their work remaining "incomplete or ... completed in a hurried manner in the remaining time".

Electronic Portfolio's

Ly Syin Lobster (1st December) recounted experiences of a current electronic portfolio project, in which the professor had considered using *HyperStudio*, but in fact the group used *Powerpoint*, noting that "some of the students struggle with [the] technology because of lack of computer literacy". Responding to this message, Rick Parkany (2nd December) reminded us that "according to best practice ... the portfolio is an authentic assessment medium BEST when it remains interactive, both in the use of "artefacts" and also in the negotiation "by learner & mentor/facilitator". Rick gave us a webpage reference to his Provaluation e-portfolio's.

Can Multimedia Authoring Projects help Comprehension?

Benjamin Choppy (3rd December), graduate student at King's College, London, asked the above question, stimulating an immediate response from three other contributors (Dr Muhammed Betz, Dennis Nelson, and Westley Field, all 3rd December).

Benjamin queried whether in the construction of multimedia projects using an authoring system, students were thoughtfully using materials in a way that "induced comprehension", or not. Noting that "the level of description and execution are not the same as in ... programming activity", Benjamin thought that in multimedia production "the computer executes the sequence of information and does not execute the information itself. In this sense, multimedia execution is very similar to that of the word processor!". He therefore thought that "successful authoring of multimedia projects may have induced comprehension in students but this is not necessarily the case". Merely to "select" and "sequence" materials successfully does not mean that students understand the meaning of the information they have used.

Muhammed Betz (3rd December) took up Benjamin's point that "the 'successful' 'sequencing' of information in such a project does not, in itself, necessarily, constitute... an explicit demonstration of comprehension???" Dr Betz noted that Benjamin had not included details of the "systematic planning process that anyone (including students) should use when producing hypermedia or multimedia projects."

Dr Betz affirmed that there "needs to be a systematic process, chosen from any of several Instructional systems design protocols, that requires the author to set goals, write objectives, determine strategies for meeting goals and objectives, analyse potential sources of content, construct a storyboard, and then begin constructing the end product with the authorware". Saying that people should not just immediately "jump into a computer software program and quickly cut and paste material into a fast and easy production", but that students should be required "to use sound techniques in the planning of their products", Dr Betz noted that if the latter were the case, "the comprehension problem will most probably be solved". Dr Betz further commented that "visual literacy" was seen by researchers Heinich, Molenda, Russell and Smaldino as "the encoding and decoding of visual messages by learners to create higher levels of comprehension and sophistication as a result of the processes are involved".

Dennis Nelson (3rd December) wrote a thoughtful response to Benjamin's queries about whether students necessarily comprehend what they are doing in multimedia production, stating that "Ben is correct. The tool is incidental". Dennis then outlined a number of issues relating to the author's awareness of, intentions about, and precision in, their own meaning-making, and the comprehension of the materials by an audience whichever medium of communication was used. . He noted that "to assess how well a tool, application, procedure or activity supports learning, comprehension or other activities first, "we could explore the basics of an intended outcome first".

Dennis concluded, philosophically, that "which task or medium requires the strictest focus, discipline, perseverance, patience, self-control, joy etc. Therein will the greatest learning, comprehension take place. On two of these, we learn to apply our knowledge to other contexts and approach wisdom."

Westley Field (3rd December) also commented on Bejamin's posting, citing a web reference for the exploration of "the definition of the new literacies and their impact on learning, and querying whether "there is a struggle here with the notion of improved literacy". Visual literacy and information age skills are being developed by students. They are in fact increasing their comprehension skills in this brave new world". Westley felt that "an interesting exploration would be to define what new literacies" students "are developing rather than be concerned with what old literacies they are missing out on". He commented, "If a picture paints a thousand words then why for so long have we been describing a picture rather than looking at it."

Further Ideas on Whether Multimedia Authoring helps Comprehension

The discussion initiated by Benjamin Choppy on the above question continued with further input from Dr Goswamy (4th December), who commented on Benjamin's and Muhammed Betz's contributions in some detail, stating that Muhammed's response should clear up some of Benjamin's "doubts" about whether multimedia authoring aids learner comprehension.

Dr Goswamy affirmed that from his point of view, when students author multimedia they do not "merely 'select' and 'sequence' the information" ...but "there is a large amount of 'analysing' and 'thrashing the issues' involved (often invisible as it occurs in the 'higher level of thinking') before actually arriving at the final sequence". Therefore, Dr Goswamy noted that it "is worth consideration that 'Can a learner or even a designer arrive at a reasonably sound 'sequencing' without actually comprehending the matter?' And if comprehending an idea and then presenting it in the best possible manner is not 'comprehension' then what is?"

Dr Goswamy therefore felt that with effective 'sequencing' (unless this was just 'mechanical programming') almost invariably comes some degree of comprehension by the learner. The role of teachers, he felt, is to "think, analyse and define clearly the 'learning outcome'.." the teacher, or, more suitably, "mentor" having "...an important part to play" to "ensure 'multimedia authoring' does not degenerate into 'multimedia editing' or still worse 'multi-media programming' .." Motivating learners to produce a task with "sufficient scope of being 'creative' ... "involves more comprehension work by the learner ..." and this is particularly the case when they are "motivated to produce..." their "... own piece". Therefore, Dr Goswamy concluded that "I have reasons to believe that in a 'learning' or 'teaching' situation the end result of 'multi-media authoring' (from the angle of Benajmin's doubt) depends on the approach taken by the 'guide' or 'mentor' in 'setting up the project', what 'learning outcomes' are aimed at and what is expected of the student as an 'author'.

Student Multimedia Designers: Critical Thinking, Expressive Learning

Meropi Hatzivei (4th December) continued the debate by shifting the focus from 'comprehension' into the concept of "developing critical thinking and especially about evaluating critically the work of others" in multimedia. Meropi expressed optimism about the potential of multimedia composition to be "both motivating and effective for learning", but noted that others were more doubtful of this, specifically about the capacity of multimedia to engender critical thought. Meropi believed that "it is really important for students to be able to evaluate, with the appropriate guidance, their own learning materials" and that "multimedia composition can be one of the most effective educational ways to enhance expressive learning".

In my own posting as moderator (5th December) I picked up on the concept of 'students as multimedia designers' as discussed by Meropi, noting that this has some history in terms of research in this field (using the concepts 'multimedia/hypermedia' interchangeably for convenience). Lehrer (1993) found that not only was there a high "degree of student involvement and engagement" in the process of student hypermedia design, but also that "taken as a whole, students' comments and actions indicated a transition from receiving to authoring knowledge"(p.210). Turner and Dipinto (1992) also found that "the time students invest in learning to use hypermedia software and hardware not only gives them a powerful new medium of communication but may also give them new insights into organising and synthesising information". They concluded that "Technology didn't just enhance the appearance of students' reports, it also encouraged them to rethink how to present information to communicate it more effectively" (p.198).

A growing number of other findings from research tend to confirm Dr Goswamy's (4th Dec posting) "personally observed facts" that "if you analyse the work done by the learner, you may observe that when students develop multimedia projects they do not merely 'select' and 'sequence' the information (like a decision tree or algorithmic approach adopted by the machines)" neither are they "strictly 'programming' the information like 'presentation of data', there is a large amount of 'analysing' and 'thrashing the issues' involved (often invisible as it occurs in the 'higher level of thinking' before actually arriving at the final sequence (comparable to drafting in precis writing...)".

Meropi's view that "multimedia composition can be one of the most effective educational ways to enhance expressive learning" has therefore some basis in research. What it seems important to remember is that, as Dr Goswamy notes, "in a 'learning' or 'teaching' situation the end result of 'multi-media authoring' (from the angle of Benjamin's doubt) depends on the approach taken by the 'guide' or 'mentor' in 'setting up the project', what

'learning outcomes' are aimed at and what is expected of the student as an 'author'. Benjamin Choppy's (3rd Dec) query as to whether in multimedia authoring students are comprehending what they do is, I think, therefore quite effectively answered by Dr Goswamy's idea that it "depends on the approach adopted to plan and carry out the 'authoring' project" and can "involve more 'comprehension' work by the learner (specially if the learner is motivated to 'produce his own piece')". So the intended learning outcomes of the hypermedia/multimedia design project, the learning environment set up, the nature of the 'scaffolding support' provided, the planning, revision and reflecting processes enabled, are significant in assisting learners to make the most of this kind of project, and to develop the 'critical thinking' and critical evaluation skills Meropi notes there are many doubts about in connection with student authoring projects.

Regarding Hyperstudio

Dr Eric Flescher (5th December) commented on the use of *HyperStudio*, noting that it is "best to update to the new 3.01 version, which includes Internet use and more features and better animation sequence." Giving some points about the use of graphics and sound in stacks, Dr Flescher went on to note that multimedia "can be a valuable tool to teach history but you have to think how the multimedia tool can make it different versus trying to fit the same old project into the multimedia with sound, graphics and text". He notes that teachers need to "frame the assignment" to make the best use of multimedia ..."showing the way is more than just showing them the software and how to use it".

Dyslexia, Dropouts, The Web and Hypermedia Composition

Glenn Ralson (5th December) noted a number of web references in terms of the "college dropouts that changed our real world", and indicates that "that personal intellectual appliance - the PC - will have increased a million times in power at the same cost over 25 to 30 years". In this situation of the vastly increased power of the PC, a "new learning space" is emerging. Glenn cited Carl Raschke, in commenting on the revolution to education implied by these changes, in which the "revolution is about "learning" not "teaching".... "control of the content of curriculum must give place to an explosion of self-crafted, ad hoc, and customised learning modules, where the great historical divide between instructor and student can be found in a state of meltdown".

Multimedia/Hypermedia/ Authoring Tools

Margaret Farren (7th December) made a thoughtful contribution to the debate, noting that she is currently teaching "about the design, creation and evalution of multimedia programmes" on a 15 hour Multimedia module for teachers. Margaret selected *HyperStudio* for her teaching, specifically selecting this user-friendly programme to avoid the "tool ... get(ting) in the way" and to enable the students to "plan, design and create a multimedia programme by the end of the course", whereas with an application like Director she felt they might not achieve this in the time.

Margaret commented that although her students were "finding *HyperStudio* relatively easy to learn", she did not agree with Belzano' s IFETS posting that "*HyperStudio* has too low a ceiling of learning for students to benefit" from using it. Importantly, Margaret commented that the "whole issue of planning, designing and implementing comes into play regardless of the authoring tool", although "it depends on the emphasis or nature of the course, and this is an issue for the facilitator/mentor".

Picking up on an earlier posting by Dr Farhad Saba, Margaret indicated that she'd like to know more about Postmodern theory in relation to teaching multimedia and hypermedia (NB - a good overall perspective on critical theory and hypertext/hypermedia is given by George Landow (1997) - see *Bibliography*).

Margaret reminded the forum that multimedia "allows us to do things in other ways, and perhaps, better ways - surely, that is an advantage". She also confirmed Dr Betz's view that "people should not just jump into a computer software program and quickly cut and paste material in a fast and easy production". She agreed with Dr Goswamy that "there is a large amount of analysing and thrashing the issues" and noted that "a lot of processes are happening when students design, develop and implement a multimedia project" - Margaret would therefore "encourage students to reflect and document these processes", querying whether others in the discussion "think that these processes are worth assessing" and asking for recommendations on how to do this.

Is Assessment of Student Hypermedia Composition Valid and Useful?

Dr Goswamy (9th December) took up Margaret Farren's queries, stating that nearly all teachers/trainers involved in facilitating student hypermedia production "willy-nilly got involved in 'exploring' the thought process that 'goes in the learners' mind (or head)". Dr Goswamy commented that this "is probably a 'by-product' of using or teaching the use of hypermedia for comprehension projects", saying that "it is apparent that 'understanding' the issues and analysing "the processes (that) are happening when students design, develop and implement a multimedia project" not only would help in improving instructional delivery but also strengthen the planning and 'goal-setting' process before undertaking a hyper-media project."

Dr Goswamy noted, however, that there is a particular problem in relation to the issue of whether such work is "worth assessing". He stated that his efforts with hypermedia have led to a conclusion that the "process involved has more to do with 'creativity' than mere 'subjective thinking' and thus the first question to ask is "will the assessment (be) sufficiently valid and reliable that it would be of any specific use for the teacher (?)". Since Dr Goswamy's work in student hypermedia composition was specifically not a research study but more of a day-to-day practical investigation, he found that "by just encouraging the students (to) 'reflect and document' these processes ... the range of response was so varied and 'indeterminate' in nature we found it too difficult ...to actually extract a common identifiable thread in the process involved which would 'unequivocally' indicate or identify the process involved."

Although some of the students' replies to his investigations were promising, Dr Goswamy "soon ... realised their limitations .. the explorations were not 'provocative' enough to reflect any in-depth analysis of the process". He and his fellow investigators "also realised that any attempt to provide external 'provocation' to explore any deeper mostly resulted in eliciting more 'right' responses which fit well-recognised patterns", since students tended to give answers that they felt were acceptable, rather than think more deeply for themselves.

Analysis of the students' replies thus led Dr Goswamy to decide that "quite well developed 'imaginative thinking' (expansive in nature) rather than ... 'evaluative thinking' (convergent in nature)" tended to be involved in student hypermedia production. Students tended to "brainstorm" rather than use logical sequential processes, and therefore he concluded that "the process involved (in the authoring-tool or hyper-media based learning or designing) had all the ingredients of a 'creative process', stimulated by "the time and efforts invested in planning, analysing and developing the idea". He was also "perplexed ... to observe that (the) higher the 'creative thinking' capability of a learner (as depicted by the quality of their work) (the) less is his capability to exactly 'reflect and document' these processes." Dr Goswamy therefore "decided not to carry out my 'investigations' any further" since he "strongly felt (he) may be doing an injustice to the learner ... as exposing them to this additional 'work evaluation' may lead to undermining their intrinsic motivation which in turn may inhibit creativity".

Final Thoughts on the Discussion on Student Hypermedia Composition

An interesting formal discussion was held in which 20 contributors considered a variety of issues in relation to student hypermedia composition. Questions about the time-consuming nature of supporting students with personal tuition were well-answered by Crispin Weston's view that the teacher could control the amount of support that was given. The issue of students as "users" versus "designers" of hypermedia ran like an undercurrent through the debate. The facilitation of student document production through 'user-friendly' software such as *HyperStudio* was, with some reservations expressed, generally found to be a productive exercise, with contributors such as Dr Eric Flescher and Margaret Farren specifically commenting on the value of such usage. In general contributors strongly advocated the methodical "planning, designing and implementing" (Margaret Farren) of student hypermedia projects by the "facilitator/mentor".

In that respect, hypermedia student production is not that much different from student work in any other field, requiring good planning on the part of teachers, with a focus on "think(ing), analys(ing) and defin(ing) clearly the 'learning outcome' "(Dr Goswamy). In fact, Dennis Nelson reminded the forum sagely that whichever "task or medium requires the strictest focus, discipline, perseverance, patience, self-control, joy, etc. Therein will the greatest learning, comprehension take place. On two of these, we learn to apply our knowledge to other contexts and approach wisdom". Dennis also noted that "the tool is incidental", reinforcing the idea that students can achieve higher levels of comprehension and critical thought, and can "evaluate, with appropriate guidance, their own learning materials" (Meropi Hatzivei) if the learning situation enabled by the teacher/mentor/facilitator is sufficiently well structured.

Doubts expressed by Benjamin Choppy about hypermedia's capacity as a medium to support student multimedia production in ways that "induced comprehension" were well answered by Dr Muhammed Betz, who reminded us that there "needs to be a systematic process, chosen from any of several Instructional systems design protocols, that requires the author to set goals, write objectives, determine strategies for meeting goals and objectives, analyse potential sources of content, construct a storyboard, and then begin constructing the end product with the authorware".

Doubts expressed by Crispin Weston about hypermedia's lack of "potential for conveying complex argument", since its "scatter-gun approach … generally gives a rather superficial coverage of the topic" may be similarly answered - the medium, arguably, *can* be used thoughtfully and well to enable students to achieve new levels of understanding and learning. So long as we remember the ideas expressed in Dr Flescher's comment that multimedia "can be a valuable tool … but you have to think how the multimedia tool can make it different versus trying to fit the same old project into the multimedia with sound, graphics and text". As Margaret Farren reminded us, multimedia/hypermedia "allows us to do things in other ways, and perhaps, better ways". But the facilitation of these processes for student authors needs to be carefully planned and carried out, so that the exercise becomes more than one in which they "just jump into a computer software program and quickly cut and paste material in a fast and easy production" (Margaret Farren, commenting on Dr Betz's statement).

To sum up, Gavriel Salomon (1991) notes, 'profound effects of intelligent technology on minds can take place only when major changes in the culture take place as well…. This means that it is not the technology alone affecting minds, but the whole "cloud of correlated variables - technology, activity, goal, setting, teacher's role, culture - exerting their combined effect. Consequently, to engineer a desirable effect either with or of an intelligent technology requires a lot more than just the introduction of a new program or tool." The structured manipulation of a "cloud of correlated variables" in the setting up of an effective authoring project for students can, however, arguably, result in learning processes involving the kind of "focus, discipline, perseverance, patience, self-control" and "joy" Dennis Nelson advocates.

However, to achieve this is not easy, nor is it automatic. For a start, as researchers McKnight, Dillon and Richardson (1996) assert, "100 years of studying learning has provided little by way of systematic knowledge for ensuring desirable learning outcomes … Hence, evaluating the interactive technology to support this process is by no means straightforward (p.627)…. Unfortunately, it is no simple matter to measure "learning" as an outcome." (p.632) McKnight et al. hence advocate the design of "user-centred, task-based design grounded in an empirical methodology" (p.632).

In terms of student projects, I interpret this to mean the setting up of focussed, grounded, situationally-specific, well-structured student hypermedia composition projects. As in the process of "learning through cognitive apprenticeship" that Brown, Collins and Duguid (Brown, 1989, p.37) and Berryman (Berryman, 1991, p.3) promote for developing meaningful learning environments, such projects require students to address real-life, practical design requirements and to document and evaluate their own learning processes in ways which are cognitively challenging . The setting up of such projects should also be linked to specific learning outcomes and to "sufficiently valid and reliable" assessment criteria designed to enable students to "think more deeply for themselves", and to measure this process (Dr Goswamy). This is an exacting challenge, which Dr Goswamy noted that his 'investigations', not being linked to a specific research project, were unable to achieve, particularly for the "more creative" learners.

It is a challenge to the research community to take forward the development of both well-designed student hypermedia authoring projects and "sufficiently valid and reliable" assessment methods for these. As I have already noted, Jonassen and Reeves advocate 'the use of hypermedia as a cognitive tool' (Jonassen 1996, pp.693-715) in realistic contexts that enable students to learn *with* technology in a constructivist sense. Their findings that '(1) learners develop critical-thinking skills as authors, designers and constructors of knowledge and (2) learn more in the process than they do as the recipients of knowledge prepackaged in educational communications' (p.713) provide a challenge to researchers to engage students more systematically as designers of knowledge in authoring and critically evaluating their own works.

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