Needs before means:

the dialectics of learning and technology

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The general argument advanced in this paper is that in the changing context of present-day higher education it is vital that our educational purposes and student needs are clarified before decisions are taken about the means, including the use of learning technology, of satisfying those purposes and needs. The development of a critical understanding is still seen as the central purpose of higher education even in the context of a more vocationally relevant mass higher education. It is argued here that dialogue is the key to critical learning based on a process of dialectical communication. The task then is to construct an understanding learning environment which fosters interaction between students, staff and resources, reconciling individual needs with collective purposes. The specific role of learning technology as a means of encouraging dialogue within a learning environment is illustrated through examples of language learning such as TLTP CKS33 and the RACE Hipernet Project. Through a dialectical process, the appropriate use of learning technologies in meeting students' changing needs can be progressively refined.

Introduction

Higher education and society in general are changing rapidly. The student body is more diverse and larger. Arguments rage about the vocational relevance of higher education. The unit of resource is declining. The way ahead appears fraught with difficulty. However, computer-based technology is advancing at breakneck speed. Is it the 5th Cavalry charging to the rescue of the beleaguered educational troops? The argument that will be advanced in this paper is that such a view is simplistic. The key issue is that pedagogic purposes and individual student needs should be first defined so as to identify the best means of meeting those purposes and needs. The general argument that dialogue based on dialectical communication lies at the heart of the learning process will then be applied to the use of learning technology in language learning. It will be demonstrated how, through a dialectical process, the appropriate use of learning technologies in meeting students' changing needs can be progressively refined.

The changing context of higher education

Three aspects of change affecting higher education can be noted. First, the move to mass higher education (Trow, 1987) has been associated with a greatly increased diversity of students. Therefore there is an added requirement to clarify the educational needs of individual students in relation to their past learning and experience and their particular motivation for entering higher education. The means of meeting those needs may also differ from those traditionally used in higher education not only because the needs have changed but also because old methods may be inappropriate with larger student numbers (or too expensive with a declining unit of resource) even before consideration is given to the new means available through the development of learning technology.

The second aspect of change influencing higher education is the continuing debate about the relative importance of vocational and academic purposes in higher education. Participants in the debate have tended to adopt an either/or position, whereas the view adopted here, following such writers as Neave (1992), Nuttgens (1988) and Reeves (1988), is that there need be no fundamental conflict between higher education for academic purposes and that with more vocational objectives. The reasons for this view will be elaborated shortly.

The third element of change is the pace of change in modern society which means that, coupled with the continuing nature of that change, much of the content of present courses will be rapidly outdated (Sadytzky and Bereday, 1977). More specifically, the means of communication are rapidly changing with the growing centrality of the audio-visual culture of television and personal computers.

The central purpose of higher education

The effect of these changes on the main purpose of higher education depends very much on our broader conception of society. If our conception is of a genuinely democratic society related to Popper's notion of an Open Society (Magee, 1973), then an essential ingredient of such a society is a mass higher-education system that encourages its participants to develop their own understanding based on critical enquiry and independence of thought (Honeybone, 1994). From an academic perspective, this has long been seen as the hallmark of the higher forms of education (Barnett, 1990). From a vocational viewpoint, a similar conclusion can be reached, particularly in the previously mentioned context of rapid change: if the individual does not develop critical understanding, the value of higher education to the economy will be short-lived as the specific content of study becomes outdated and the individual is lacking the critical skill of thinking through how best to act in new situations.

But some clarification of the word *understanding* is required. It is a word used with different meanings ranging from 'reproducing content' to 'developing an individual conception' (Entwistle and Entwistle, 1992). In the present context it is being used with the latter meaning, that is in the sense of 'conceptual understanding' which involves making connections and weaving 'bits of knowledge into an integral and cohesive whole' (Nickerson, 1985). However, that definition introduces another word with diverse interpretations, namely *knowledge*. In this paper, the word is used in the wider sense

adopted by Eraut (1992), encompassing propositional, process and personal knowledge. In this formulation, knowledge is something that is being actively worked on rather than passively received by the learner.

The learning environment

Following the seminal work of Marton and Säljö (1976a and b), it is argued that conceptual understanding can best be achieved when students adopt a deep (learning as transforming) rather than a surface (learning as reproducing) approach to learning. The aim, then, is to develop a learning environment that will encourage students to adopt a deep approach and strive for conceptual understanding. Such a learning environment will include the complete setting for learning provided by a department or institution, including the curriculum, the way the curriculum is taught, the way it is assessed, the material resources to support learning, including learning technology, and the type of interaction or dialogue between staff and students.

This interaction, and indeed the interactions among students themselves and also with the material resources, can be seen as central to the development of understanding: deep learning leading to conceptual understanding through dialogue. However, such dialogues are mediated by a number of influences: the needs, learning styles (Kolb, 1984) and experience of individual students, the learning and teaching styles and experience of staff, and the resources and technology (the means) available. Needs should come before means, but with those individual needs being reconciled with the collective purpose of higher education. This argument will now be developed using language learning (within a communicative approach) as an example. We learn to comprehend the world, to understand it better. At every stage, we need to communicate our interpretation of our comprehension of the world (to start with, comprehension of our immediate environment, then of a more distant one) to ourselves and to others. In order to do so we use language.

This paper, then, considers the particular role of learning technology in aiding dialogue in language learning.

Dialogue as a model of communication

The word *dialogue* comes from the Greek *dialogos*. It is in its first meaning a conversation between two people, encompassing the notion of critical enquiry (Plato, 1965; Russell, 1991) in which the learner engages in a process of questioning conventional knowledge. Dialogue cannot be divorced from social interaction and, as face-to-face conversation, it can be seen as the basic model from which all other forms of human communication ultimately derive (Good, 1995).

In a dialogue, both the speaker and the listener are actively engaged collaboratively in a reciprocal activity (Brown, 1986). (Brown was writing in the context of language learning, but similar arguments have been advanced for the centrality of dialogue in the sphere of learning in general – see Gibbs, 1992.) Both participants in the dialogue are, in turn, speaker and listener, and as such co-operate actively in constructing a coherent interpretation of each other's texts. Together they construct the communicative message.

Such communication, i.e. the construction of a joint discourse, is based on interaction encompassing both receptive (particularly listening) and productive (particularly speaking) skills. Such an interaction is today understood to be made up of many elements encompassing both the linguistic and social/cultural sides, and is viewed as central to language learning. It takes into account the knowledge and competence of many areas – obviously linguistic competence (lexical, grammatical, semantic and phonological) and socio-linguistic competence (politeness conventions, registers), but also general competences such as knowledge of the world , socio-cultural knowledge (knowledge of society and culture of the target community), and inter-cultural awareness (awareness of the differences between the world of origin and the world of the target community).

Intentionality

Thus, as Brown (1986) argues, dialogue is 'a risky business'. At every stage of the construction of the message, both participants make choices on what seems to be the most appropriate interpretation of each other's texts, and they construct appropriate mental representations. They do so in order to allow the common message to be woven as successfully as possible. Here it might be appropriate to explain the notion of intentionality in a dialogic interaction. If we subscribe to the widespread belief that we learn languages to communicate, then it is legitimate to assume that intentionality plays an important role in successful communication, intentionality not just on the part of the speaker but also on the part of the listener (Brown, 1986). Just as the speaker speaks with intent, so the listener listens with intent. (The way in which learning technologies may be able to accommodate the variations in intentions of individual learners will be considered later.) Indeed, it could be argued that if the listener is not intent on playing his part fully in such an interaction and chooses not to co-operate, the result would be at best misunderstanding, and at worst breakdown in communication. Some linguists believe that misunderstanding rather than understanding is common in communicative interactions (Spolsky, 1995), and that its wide prevalence signals the difficulty of understanding.

Context

If the dialogic process leading to understanding is fraught with difficulty, it is not an impossible task. There are parameters which can help to ensure a more successful communication. One such parameter is context. *Context* here is used in its wider interpretation encompassing the notions of background, mutual and shared knowledge (Shank and Burnstein, 1985). Communication is seen as 'the reduction of uncertainty, where speakers fill in the gaps in each other's knowledge, negotiating meaning and modifying their own knowledge interpretations as the discourse progresses' (Brown, 1989). In such approaches, context helps the listener to predict what the speaker is likely to say. The more the participants know about each other, the closer their social background, the more similar their use of language, and the more mutual the knowledge they share, the more successful the communication. In a familiar setting, with a familiar speaker, on a familiar topic, the listener tends to find that many of her or his predictions are correct. In those circumstances, meaning is negotiated and understanding is developing, thus a more successful discourse progresses.

Genres of language use

Of course, not every communicative interaction has the same level of 'risk'. For example,

provided you are a reasonable intermediate speaker of French (GCSE-type level), it is unlikely that you would go into a bakery in France with the intention of buying 'deux croissants' and that you would come out carrying a dozen cakes. Apart from the familiarity of the topic and the setting and predictability of the language, the *genre of language* needed is not conceptually very demanding. In the sphere of language learning, the different genres of language used at any particular point in a communicative task can lessen or heighten the difficulty of understanding, and thus whether the message is successfully elaborated or not. The ease or difficulty of understanding is linked to the amount of cognitive load imposed on the participants in an interaction. The less the cognitive load, the easier the understanding. The more demanding the cognitive load, the more difficult the understanding. In language learning terms, the simplicity or complexity of language needed in such interactions must always be taken into account. The language needed in transactions such as the one described above is conceptually less demanding than the language needed to engage in an argumentative discussion of Sartre's assertion that 'l'enfer, c'est les autres'.

A brief explanation of what is meant by *genres of language* may serve to clarify the point. There are broadly speaking four genres of language: procedural, transactional, narrative and argumentative.

Procedural language deals mainly with instructions (how to do something, how to get somewhere etc.), and it is barely necessary to understand the language in a linguistic mode, in the sense of being able to repeat it back or constructing a summary of what has been said (Brown, 1995).

Transactional language deals mainly with everyday-life situations (buying something, asking for information, requesting a service), and it is highly predictable and familiar. The language needed is functional, and covers certain structures and forms of language. In spatial and temporal terms it is usually a here-and-now affair.

Narrative language is found in reports, historical documents, anecdotes, the planning of future events as well as novels or short stories. It involves the ability to understand content in a temporal sequence of events, in a given spatial domain (Brown, 1995). Understanding a narrative is more demanding conceptually since the listener must carry in her mind at all times a reconstructed interpretation of the sequence of events both spatially and temporally, and try and make sense of the causality and intentionality of relationships.

Finally there is the language of arguments, explanations, justifications, theorizing. Compared with procedural or transactional languages (and to a certain extent narrative language), argumentative language has less connection to the real, physical world. It is more abstract and complex, and fewer concrete props are available to the listener engaged in such a dialogue. The cognitive load on the participants is even greater than in narratives. Understanding a theory, an argument or a justification is mainly done through the medium of *linguistic input*. Both participants in such a dialogue must infer a lot in their interpretations of each other's constructs and their relationships.

The communicative approach in language learning

In the past, the academic study of foreign languages was primarily to allow learners to read literature in the original text. As such, the learning of language was primarily the learning of the written form of language. And yet understanding the spoken language is one of the requirements for language learning in order to make it your own (what linguists call *language acquisition*).

The move towards a wider view was advanced in the 1960s by the pioneering work of Lado who distinguished four skills in language learning: listening, speaking, reading and writing (Lado, 1964). In the 1970s, building on Lado's ideas, the Council of Europe's *Threshold Level* made the case for a *communicative* approach to language teaching (Council of Europe, 1976). Such an approach promotes language learning as a social activity; it has a functional view of language learning, and emphasizes the social roles of social interactants. Similar ideas on the importance of social interaction have been applied to learning in general, for example in the advocacy of problem-based learning (Margetson, 1994).

A communicative approach is based on three fundamental principles. The first and central one is that of learners' needs; the second one is that of learner-centredness, and the final principle is the primacy of the functionality of language use over its form.

Communication with others can be through the medium of oral or written discourse, and since the development of new technologies, it can be both oral and written simultaneously. It is precisely this simultaneity of access to both forms of language that gives new technologies a vital place in the language-learning process.

Dialectical communication and new learning technology

Building on the original definition, dialogue can be interpreted more widely to include dialogue with self and dialogue with technology whatever the technology – be it a text, video or hypertext. It is in this wider interpretation that dialogue can be seen as the key to learning (Mayes, 1995), and one which can be transformed by technology (Good, 1995). However, it would be simplistic to suggest that a more technologically-based dialogue would necessarily help to maintain, in the present move to mass higher education, an appropriate critical perspective. For that perspective to be maintained (and maybe enhanced), new means of dialogue must ensure a continuing interaction between the participants, leading to qualitative change, i.e. greater conceptual understanding. That, it is argued, can be aided by a particular form of dialogue based on Hegel's notion of dialectical communication, that is 'the development of thought which tends towards a synthesis (union of contradictions) striving continually' to resolve oppositions between each thesis (affirmation) and its antithesis (negation)' (Larousse 1986). Through such a dialectical interaction, students construct their own understanding and interpretation of knowledge. And that could be a key test of the appropriate use of learning technology in higher education: does it aid understanding and interpretation?

Non-reciprocal/reciprocal
In answering this question, the distinction between reciprocal and non-reciprocal communication is helpful (Widdowson, 1978). In an oral/written dialogue between two

people, both participants are overtly and actively engaged in a reciprocal activity (speaking to one another or writing letters to one another). However, in listening to the radio, watching TV or reading an article, while the listener/viewer/reader may still be actively engaged, the dialogue is a covert and internal one with the producer's/writer's message. It is a non-reciprocal activity.

The latest developments in learning technology are overcoming the restrictions of non-reciprocal communication, and thus are better able to aid understanding and interpretation. New technologies are intrinsically non-linear, allow more choice and just-in-time access to the learner, and with their never-ending supply of integrated resources can make learning in general and learning a language in particular a virtual reality.

These five points of non-linearity, choice, just in time, integration and virtuality which multimedia brings to the learning process, can make language learning a richer, freer, more satisfying and ultimately qualitatively different learning experience. They will shortly be considered in more detail.

Linearity/non-linearity
It is non-controversial to say that the written form of language is linear. On the one hand, the medium (print) demands it. On the other, the writer writes her books/articles with the reader in mind. In that sense, the writer takes every step necessary to produce a printed text with the following elements in mind: shared knowledge of the world and of the topic in discussion, of the reader's reactions, and of the forms and structures of the language. She intends the message to be understood: it is perhaps in this light that Krashen's 'comprehensible input' should be primarily viewed (Krashen, 1985). Therefore, the writer organizes the arguments and presents them in a way that conventions dictate and that is both clear and logical, taking, so to speak, the reader gently by the hand. This is not to say that the reader does not stop here and there to dispute/counter-argue with the writer's message – some readers do. Indeed, this internal dialogue with the writer's message, this deconstruction and reconstruction of the message, is vital to deep learning (Honeybone, 1994). In language-learning terms, this process is inherent to the learning of the foreign language since each person's construct-language must be, to some extent, an individual construct (Brown et al, 1994), as indeed it can be argued for learning in general (Sutherland, 1992).

However, with the linear written text, the learner's attempts to construct his own message is made more complex by the fact that language is just one element of communication; context (i.e. mutual and shared knowledge, background knowledge, scene-setting) as explained above is also important. It is more difficult to grasp context in a printed text, since meaning is approached solely or mainly through the written forms of language; thus, meaning must be constructed before an overall context can be revealed. On the other hand, visual texts (i.e. on the whole, spoken language and moving images) usually transcend language and give to the learner direct access to context. They are intrinsically non-linear. The language of a visual text is more diverse than that of a written text. It is made up of words (linguistic elements as in the written text), images (giving context and settings) and technique (angle of shots, music, pauses, rhythm of sentences, visual effects, colour, rhythm of montage) (Compte, 1993). This new technology, by increasing access to visual texts, can aid learning.

Choice and just-in-time concept
Within the same environment, the learner has access to a wide variety of texts – video, audio and print. He can browse through them and choose what corresponds to his needs in order to construct his own interpretation.

The 'just in time concept' of retrieval allows the learner greater choice in his learning. It could be argued that multimedia gives the learner a richer, more comprehensive internal dialogue when he looks in the software for answers to his questions. By browsing through the multimedia, incidental learning is potentially greater than if the learner were just reading a text or listening to a tape. However, there is the danger that the very richness and variety of the choice may lead to cognitive overload (Rhéaume, 1993).

Integration
Learning technology may help language learning further by bringing together within one environment different media – print, audio and video – thus making skills-integration easier and more realistic for the language learner. As previously noted, a language learner needs to be competent in all four skills (speaking, listening, reading, writing), although not all learners need all four skills; or, to be more precise, not all learners need to develop all the skills at the same level of proficiency (King, 1993). Skills are rarely acquired in isolation. In most commonly encountered contexts, they are integrated – indeed the speaking and listening skills are at the basis of dialogue. Reading and speaking (or vice versa) and listening and writing (or vice versa) are acquired together since in almost all real-life situations they will be used together. Different skills (needs) need different resources (means). Analysing learners' needs leads to analysing available resources in order to find out which resources serve which skills best.

Virtuality
Multimedia offers the learner not just images and sounds of the country of the target language but also opens many doors to make her feel already 'at home'. She can go to the Louvre and glimpse the Mona Lisa at the press of a button. She can, via a forum, ask a student in a university of the target language to tell her how life is in this university prior to her taking a course in this same university. The examples are numerous.

For all these reasons, developments in technology over the last 10 years have great potential to stimulate learning.. Furthermore, such technology builds on our learners' extensive televisual culture in our world of images (Porcher, 1976) and on their fast-developing computer literacy acquired before entering higher education.

The dialectics of learning and technology
Once needs have been analysed, the question that arises is: which means for which needs? Our thesis is that as language-learning needs change and technology develops, so does the dialectical relationship between needs and means, i.e. between learning and technology. The nature of this relationship is shown in Figure 1.

The thesis that earlier CALL (Computer-Assisted Language Learning) was good for the development of reading skills is countered by the antithesis that highlights the fact that it was not suitable for other skills. A synthesis is found in later CALL which allows the development of not just reading skills but also to some extent listening and writing skills (with writing skills only in a closed context but not developed as a creative, productive
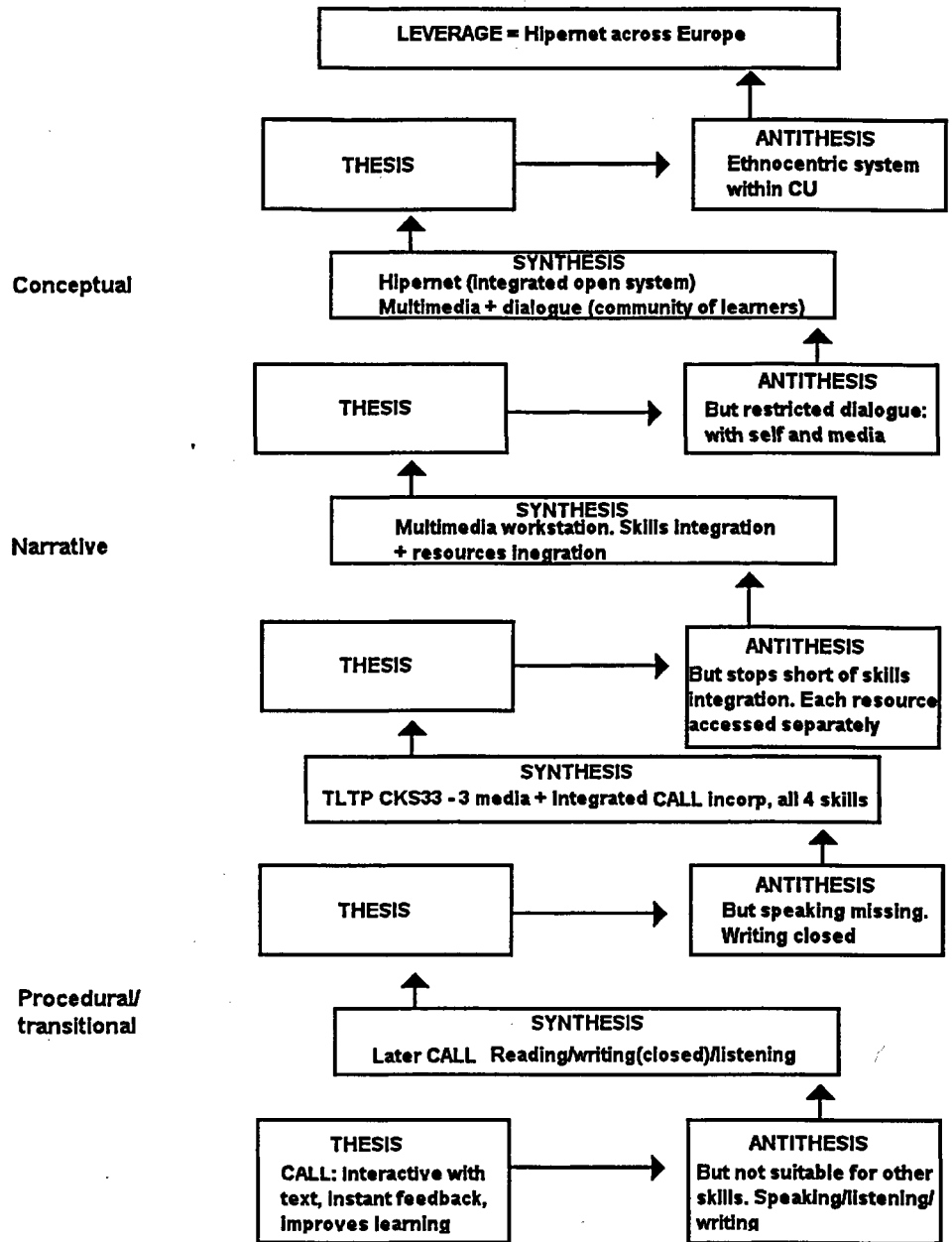
Figure 1: Representation of dialectical relationship between needs and means, between learning and technology

skill). This in turn becomes a new proposition (or new thesis) which is challenged by a new antithesis that stresses the fact that in later CALL, writing is still closed and speaking as a skill is still missing.

And so the dialectical nature of learning and technology develops (Figure 1), leading to a new argument (synthesis) exemplified by TLTP CKS33, a multimedia project using the 'traditional' media of print, audio and video with contextualized and integrated CALL. CKS33 allows for not just a wider integration of media but also for more developed writing skills. But this in turn leads to the counter argument (antithesis) that CKS33 stops short of skills integration which a multimedia workstation (new synthesis) can now provide. This new thesis soon highlights the fact that a multimedia workstation restricts dialogic communication since dialogue takes place only with self and with the technology. This leads to the new proposition (synthesis) of Hipernet (High Performance Network) which is an integrated open system using the infrastructure of the Granta Backbone in Cambridge (fibre-optic network) and which aims to develop a community of learners.

Hipernet (a RACE project) puts dialogue between learners first by encouraging a task-based approach to language learning through video-conferencing while allowing learners to enter into a dialogue with technology through the multimedia learning tools at their disposal (BBC *French Means Business*, a multimedia glossary). LEVERAGE (Learn from Video Extensive Real ATM Gigabit Experience)[1], building on Hipernet, aims to overcome the ethnocentricity of Hipernet (system operating solely within Cambridge University) by taking it across Europe.

Our thesis is further strengthened by taking into account the four genres of language learning as well as the four skills. Earlier technology suited the less complex genres of language use, and it is only lately that learning technology has been able to play an important part in the learning of the more complex genres.

Procedural and transactional genres of language can be served by CALL, and particularly by later CALL, since this genre of language (as previously argued) is highly predictable.

The narrative/discursive genre of language (to be understood at post-GCSE level) can be served by a multimedia environment since context is paramount for narrative understanding and, as previously argued, the visual text gives the learner direct access to context. Multimedia encourages the learner to follow his own train of thought or, to be more precise, allows the learner to jump from one thought to another, come back to the first one and then wander around the hypermedia led by his curiosity and sense of discovery. Thus the technology is encouraging a more independent style of learning which motivates the learner and enriches the learning process. As he makes more and more decisions about how to fulfil his language-learning needs, the learner uses the technology which is the more appropriate to those needs.

Conceptual/argumentative language, as stated earlier, is above all abstract with fewer concrete props or links with the real, physical world. Conceptual language is used when communicating arguments, explanations, justifications, theories. Within this framework 'communication' can be seen as encompassing the notion of Plato's critical enquiry in which the learner engages in a process of questioning conventional knowledge. In this case 'dialogue' could be seen as the highest form of learning, and, with the latest developments in technology, such a dialogue, mediated by technology, can be with others – peers and teachers. Until recently, dialogue using learning technology solely involved the learner communicating with a system (CALL, TLTP CKS33). Now, using developments in data communications, such as broadband technology, the learner is able

to communicate, both *with* the technology and *through* the technology, with a wider community of learners as is the case with Hipernet and LEVERAGE. The learner is no longer restricted to the language of the teacher or the texts provided, but can herself look for texts (both written and visual) that are appropriate to her needs. Furthermore, she can have access to peers of the target language, making learning the target language a real and fulfilling experience, asking real questions to get real answers. and not having the teacher ask her questions which the learner knows very well that the teacher already knows the answers to.

Conclusion

These examples of the use of learning technology in language learning demonstrate that once the appropriate use of technology has been initially identified and then put into practice, if successful, the learning technology will itself help to refine further both purpose and needs, leading in turn to further revisions in its use. A similar analysis could be undertaken for other areas of learning.

But the centrality of dialectical communication in higher education goes beyond its use in clarifying the most appropriate pedagogic role for learning technology. It also epitomizes the approach which both staff (as expert learners) and students (as novice learners) should adopt towards their subjects. As Montaigne, the sixteenth-century French philosopher, put it:

> C'est témoignage de crudité et d'indigestion que de regorger la viande comme on l'a avalée. L'estomac n'a pas fait son opération s'il n'a fait changer la façon et la forme à ce qu'on lui avait donné à cuire.

> (It is a sign of a bad digestion to bring up food in the shape it was swallowed. The stomach has not done its work if it has not changed the nature and form of what it is given to eat.)

And that, maybe, is how we should be evaluating our use of learning technology: is it enriching our students' diet and helping them to digest their studies and nourish their own understanding?

Note

[1] LEVERAGE is a project within the ACTS programme (Advanced Communications Technologies and Services) made up of eight European partners aiming to encourage greater international co-operation by establishing inter-country links between northern and southern European users, i.e. staff and students from Cambridge University, INT (Institut National des Télécommunications) in Paris, and Universidad Polytechnica de Madrid.

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