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Ruth Harris

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An evaluation of CAN8 as a Computer Assisted Language Learning tool in the context of current research.

Ruth Harris. Institute of Technology Blanchardstown

The CAN8 virtual language laboratory combines features of traditional language laboratory systems with typical CALL software and features of CBT to create a language learning environment which embraces many different theories of learning and more specifically of language learning.

Features of traditional language laboratories include:

- Listening and viewing of audio and video materials
- Student participation through listening, repeating and reviewing
- Teacher intervention to provide feedback

CALL type exercises (with feedback and scoring)

- Multiple choice questions
- Gap-filling
- Text-writing based on oral or written stimuli

CBT features

- Presentation screens for introducing materials
- Verbal instruction to guide students through a lesson
- Menu-driven to give students navigation control
- Tracking and scoring to allow the teacher monitoring control

Given the features outlined above, the question one must ask is if the technology of the CAN8 system is in fact effective in supporting language learning and if it has acquisition enhancing features which can lead to successful L2 learning. Several areas of research need to be looked at in this context, namely the broad principles of Second

Language Acquisition research, theoretical underpinnings of multimedia and aspects of the psychology of learning. A suggested best practice for designing lessons on CAN8 allows for integration of the theoretical background and evaluation of shortcomings outstanding in the light of recent research on technology in learning.

1. Second Language Acquisition theory

A brief overview of the requirements for second language acquisition to take place allows us to see how classroom teaching and by extension technology and in particular CAN8 can provide optimal learning environments. For this purpose, a basic model for language acquisition based on communicative methodologies will be used, summarised by Pica (1994) but drawing on work by Krashen (1980, 1985), Long, (1983, 1985), Swain (1985), Schmidt (1990), Lightbrown & Spada (1990)

Pica sees three ***learner related requirements***:

1. Comprehensible input must be provided which learners access for meaning
2. Learners produce modified output based on this new input
3. Learners need to attend to form, preferably at both the input and output stages

Process-related requirements are seen to be:

1. Positive input: input that is grammatically systematic must be available to serve the learning process
2. Enhanced L2 input which makes subtle use of more salient features can assist the learning process.
3. Feedback and negative input is needed to provide learners with meta-linguistic information on the clarity, accuracy and / or comprehensibility of their interlanguage.

The ***negotiation of meaning*** is seen to be one of the main ways in which input and output are manipulated in tandem to produce meaning but also to achieve levels of modification on the part of the learner’s production. Pica defines negotiation of meaning thus:

> This term has been used to characterise the modification and restructuring of interaction, that occurs when learners and their interlocutors anticipate, perceive, or experience difficulties in message comprehensibility. As they negotiate, they work linguistically to achieve the necessary comprehensibility, whether repeating a message verbatim, adjusting its syntax, changing its words or modifying its form and meaning in a host of other ways.

While in recent times, the frequency of modified output arising from negotiation of meaning as a major feature of classroom interaction has been questioned, it still serves as a metaphor for the type of dialogue which occurs in classrooms between active learners and teachers. While it is a normal part of classroom discourse, it can be more difficult to incorporate into technology driven coursework. However, research by Ellis (1995) has shown that by pre-modifying input as one would expect to happen spontaneously in a classroom situation, an approximation of negotiation was arrived at and students seemed to benefit equally from this. In the context of CAN8, several modified forms of meaning can be presented through interactive processes, and with the presence of the teacher as interlocutor as well as the software, the negotiation of meaning can be extended beyond the technology to the human dimension.

2. The development of technology for language teaching

2.1 From language laboratory to multimedia laboratory

Traditionally the language laboratory was seen to be a learning environment which supported behaviourist theories of learning in the form of drill and practice, mostly listen and repeat. While behaviourist theories in the context of language learning have been largely dismissed since communicative methods have replaced audio-visual methods, there remains some place for some aspects of behaviourism. This is true particularly with regard to physiological aspects of language learning such as the training of the speech organs to produce sounds correctly through imitation and practice. In keeping with more modern thought on learner reflection, there are also deeper processes at work at the same time which can be built in at a more cognitive level such as attention to form and phonetic components. Wild (1996) notes:

> In much of the current and recurring debate about the role of educational and learning theory in instructional technologies (especially multimedia), there seems to be a readiness to polarise one theory of learning (behaviourism) with a meta-theory (constructivism), and further, to present the former as grossly deficient and the latter as the only credible explanation of student learning… there are various dimensions in different theories of learning, and not all fit along an imaginary continuum connecting two extremes.

The main difference between the language laboratory features of the traditional lab and of this virtual lab is probably in the pacing of the exercises. While the traditional lab led the student through a series of exercises at a pre-determined pace, this has given way to a more learner controlled environment where the learner has time to engage in the learning process, taking time to notice linguistic features and make evaluations of his own performance on the basis of feedback.

2.2 From floppy disk to multimedia

Many of the early CALL packages resembled language laboratory-type drills in written format, focussing on grammatical structures, at a time when behaviourist theories were already being discarded in favour of more communicative type approaches to language teaching. Watts (1997) in his evaluation of CALL software notes Cook’s remark that

> there is a mismatch between the views of language teachers that students learn by making realistic use of language and CALL assumptions that students learn by drilling and mastering rules.

Watts notes that the advent of interactive multimedia did not necessarily mean a re-thinking on content, but rather adding on features and notes Conomos (1995) description of this sort of software as “shovelware”.

Watts puts forward a learner-based approach to multimedia design in keeping with current thinking on language learning. The first reaction one would have on reading it is that it would be impossible for any one piece of software to fulfil the expectations put forward by Watts. On further reflection, it becomes apparent that perhaps only an authorable multimedia system such as CAN8 can be flexible enough to deliver on many of the suggested features.

Watts' main recommendations are to empower the learner as much as possible by giving him choice and control over his environment and sees this essentially in four areas. In the area of learner needs, he notes:

- The need for ***learner autonomy***, not just in process but also in content. CAN8 allows for discussion with learners in advance of design of their needs. It also allows for open-ended tasks to allow for learner expression.
- ***Mindful engagement*** is facilitated by the provision of menus and a range of exercise types clearly leading to an overall outcome.
- ***Learner strategy development*** is ongoing with student access to a visual representation of sound bars, for example and suggestions on how to approach a lesson.
- ***Different learner styles*** are facilitated through different exercises and by providing the student the choice of working with sound or with text + sound, or image + sound or text + image.

Other recommendations in the area of learner situations include the need to provide at times a totally autonomous individual environment possibly in distance learning mode and at other times a co-operative learning environment. In fact CAN8 provides a platform for each of these learning situations and allows for a combination of each.

2.3 Re-humanising the computer interface.

An important point with CAN8, is that unlike ready-made software, the teacher still has an important role to play in providing feedback and interaction. Barnett (1998) in his article “Teacher off: computer technology, guidance and self-access”, considers the role of the teacher in the context of new technologies, and in the overwhelming move towards self-access which technologies seem to imply. While he goes to great lengths to look at how the technology can replace the teacher as magister (information feeder) pedagogue (information source) as put forward by Higgins (1984) or as guide (trainer in strategies) as he suggests himself, and notes Meskill’s study where provision of on-line messages re-humanised the face of her software, keeping the teacher within the loop does not appear to be an option. Many CD-ROM based language learning packages go to incredible lengths to anticipate all possible questions, or to provide feedback for a whole range of acceptable, semi-acceptable and unacceptable learner responses. Keeping the teacher as a flexible source of feedback may be more effective in terms of satisfactory learner interaction and also more cost-effective in terms of avoiding unnecessary programme preparation for hypothetical needs.

3. Psychological aspects of language learning and task design: Acquisition-promoting language tasks

Much research has been carried out in the area of learning psychology in general and in language learning in particular on the types of activities which enhance language acquisition.

3.1 Depth of processing

Craik & Lockhart (1972) put forward their Depth of Processing model which posits that processing of verbal information normally takes place at an automatic level and is processed superficially. By creating tasks at different levels of depth, the learner can be forced to engage in deeper levels of processing. The higher the level of cognitive engagement in the task, the greater the level of retention.

Based on these theories, Paribakht & Wesche (1997) carried out research to evaluate the types of possible tasks which learners and teachers find useful for promoting language acquisition and in this case in particular, vocabulary acquisition. They suggest 5 levels of task from low levels of engagement at the noticing level to high levels of engagement at the production level.

1. Selective attention: target words bold-faced or in italics, or glossary provided
2. Recognition: Matching words with definitions, synonyms, pictures etc.
3. Interpretation: Selecting correct and incorrect words, choosing from an MCQ
4. Manipulation: manipulating grammatical or morphological features
5. Production: cloze exercises, answer questions etc.

They found that students tended to prefer type 1 and 3 exercises, and it is important to note that these are still low in the area of engagement, and are fairly typical of many textbook type exercises. It is interesting to note that in that study, learners and teachers estimated that their learning gains were at around 60%, when in fact they were only at 36%. This would suggest that learners often content themselves with relatively superficial levels of engagement and over-estimate the level of acquisition they have reached with regard to new features of language, whether formal or lexical.

3.2 Generative models of learning

Joe (1998) carried out a similar study on the value of task-based learning, but she focused on the higher levels of engagement and in particular on generative type exercises. Her research found that generative processing enhanced learning, with greater levels of generative processing leading to greater levels of vocabulary gains. She used Wittrock's (1975) generative model as a basis for her design.

> The underlying assumption behind the generative model is that generative processing, generation or elaboration leads to improved retention by learners actively generating their own creative versions of language in response to target items read in a text for example, reformulating in their own words the meaning of a word and enriching and embellishing aspects of the target item

> which relate to existing knowledge. This process connects new information with existing information and enriches new items with what is already known.

Recall of recently learned language seems to have a double effect, and she notes Baddeley (1990)

> The act of successfully recalling an item increases the chance that the item will be remembered. This is not simply because it acts as another learning trial, since recalling the items leads to better retention than presenting it again: it appears that the retrieval route to that item is in some way strengthened by being successfully used.

While Craik & Lockhart's depth of processing model proposed an alternative to short term and long-term memory, there is a strong case for looking at generative learning as operating on information which is temporarily stored in working memory and which through recall and retrieval is committed to long term memory.

Implications for CALL:

It is clear that repetition and recognition type exercises alone will not be sufficient to create a depth of processing of language which will lead to satisfactory levels of acquisition. The challenge therefore is to harness the multimedia systems available to create greater depth of processing and higher levels of interaction to promote an enhanced acquisition-promoting environment.

3.3 An evaluation of the multimedia environment for language learning.

Research on multimedia in general tends to focus on the advantages of the multimedia environment over the paper environment, software over books, and the addition of sound to a previously silent means of presentation of material. The aim was therefore to create teaching materials which were different to books and imitated the lecture or lab and provided the learner with interactive opportunities to learn. In the context of language learning, the focus has been slightly different. While language learning also drew on paper based resources, we also had a generation of technology-based learning environments which were based on audio, in the case of tape recorders and language laboratories and video in the case of TV / video based classes. Multimedia therefore in real terms meant the addition of textual and graphic support to a previously audio–dominated environment. Language learners staring into space as they mechanically repeated sentences in a language laboratory gave way to learners interacting with textual support and graphic and video displays.

3.4 Dual-coding theory

Paivio's dual coding theory supports the importance of imagery and visualisation in cognitive operations, and while it is important in all areas of educational psychology, it has particular applications in the area of language learning. Paivio states (1986)

> Human cognition is unique in that it has become specialised for dealing simultaneously with language and with non-verbal objects and events. Moreover, the language system is peculiar in that it deals directly with linguistic input and output (in the form of speech or writing) while at the same time serving a symbolic function with respect to non-verbal objects, events, and behaviours. Any representational theory must accommodate this dual functionality.

He identifies three types of processing involving dual-coding:

1. Representational: verbal or non-verbal information is directly activated
2. Referential: verbal information is activated by non-verbal information or non-verbal information is activated by verbal information
3. Associative processing: representations within the same systems are activated.

3.5 Towards a psycho-linguistic model of lexical development.

In the context of second language learning, the use of visual image with the L2 graphemic or phonetic representation has the further value of strengthening the connection between the “signifié” or signified object and that of the “signifiant” or signifier, while by-passing the L1 translation which often impedes progress in acquisition of a new word in its semantic entirety. In Jiang’s (2000) analysis of lexical representation in L2 acquisition, he notes that there are three stages of lexical development and in many cases poor learners may never get past the early stages, and in fossilisation, learners fail to reach the final stage.

Stage 1

While L1 words are learned as both semantic and formal entities, L2 words are learned mainly as formal entities, the meaning being provided through association with the L1 word. This means that the L2 items have no lemmas (semantic and syntactic information). This is the formal stage of lexical development. Grammatical information is stored in a separate area of the L2 learner’s knowledge and cannot be accessed automatically. He summarises the problem thus:

> In receptive use of the language, the recognition of an L2 word activates its L1 translation equivalent, whose semantic, syntactic, and morphological information then becomes available and assists comprehension. In productive L2 use, the pre-verbal message first activates the L1 words whose semantic specifications match the message fragments. The L1 words activate the corresponding L2 words through the lexical links between L1 and L2 words.

Stage 2 The L1 lemma mediation stage

At the second stage, the L2 lexical item has the lemma from the L1 equivalent and this is activated automatically.

> Information in L1 lemmas may be copied or attached to L2 lexical forms to form lexical entries that have L2 lexical forms but semantic and syntactic information of their L1 translation equivalents.

He notes that no morphological information is carried by the entry at either the first or second stage. Another important point is the fact that the L2 item has a very weak conceptual representation, and furthermore the L1 lemma is weak, part of it being lost in translation.

Stage 3 The L2 integration phase.

At the third stage the lemma for the L2 entry becomes filled out semantic, syntactic and morphological, as well as formal specifications about an L2 word are established within the lexical entry.

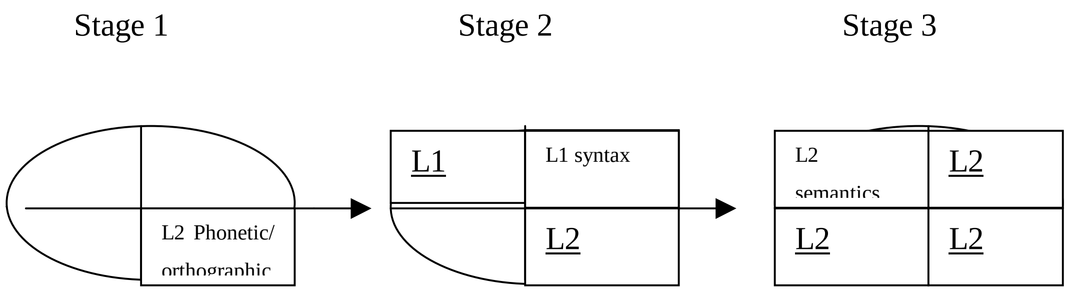


Figure 1. Jiang's model for the development of lexical competence.

An obvious aid to enriching the lexical entry for individual words would be to provide more visual material, and if this is evocative enough of the new cultural context, it might serve to move the L1 concept out of the L2 lemma space. Thus, learning the word "boulangerie" meaning bakery would be re-enforced if new information on the word included a visual representation of the concept, to displace the image of a bkery in an English-speaking context, which might very well be the sliced bread corner of the local supermarket.

3.6 Which visual aids?

While the value of visual materials is accepted, the choice of materials also needs to be considered. It is important that they aid comprehension rather than obstruct it. Poor use of visual aids can be distracting and may overload the learner's working memory, leading him into irrelevant conceptualisations of supplementary materials rather than on focusing on the materials which are directly presented to him.

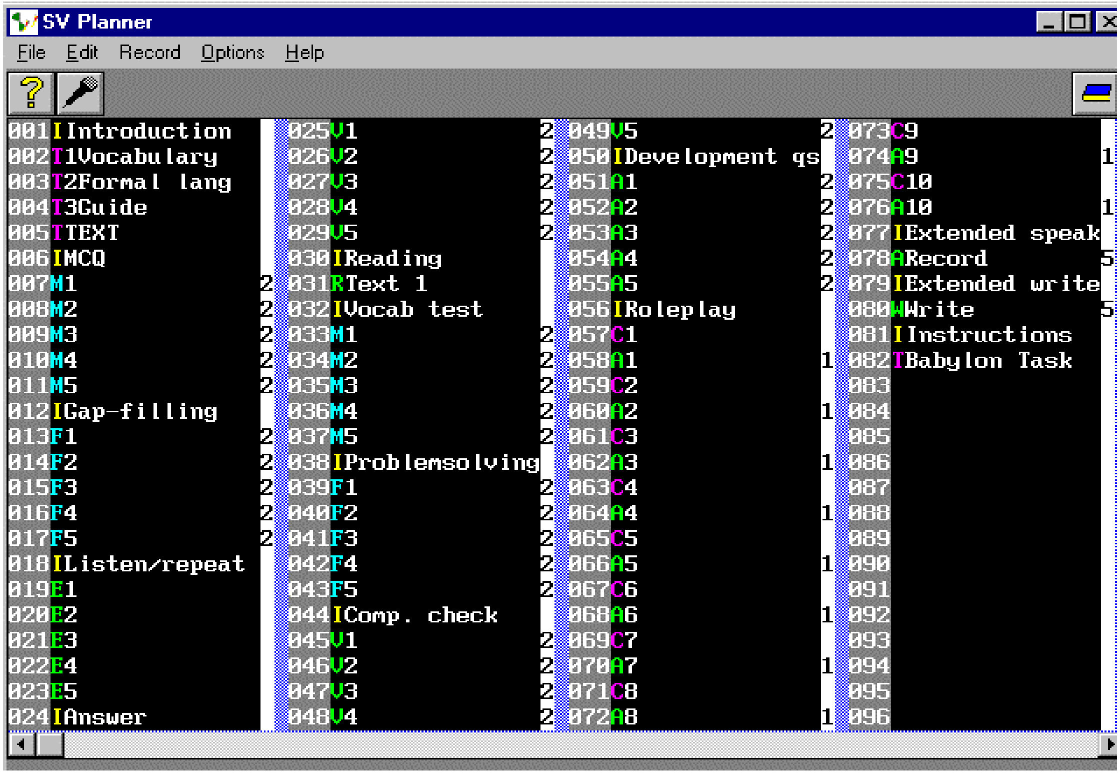
For this reason, Chun & Plass (1997) would argue that in using multimedia, a single still image should be used for a single lexical item. This provides an immediate representation of an unfamiliar object without overloading the cognitive facilities of the student. A video clip, which will provide a lot of incidental information not directly relevant to the understanding of a word may not leave the learner with a clear message, and later recall may in fact link the lexical item with some other element of the video clip. Other researchers such as Al–Seghayer (2001) have found that a video clip which clearly demonstrates an action, such as a yawn breaking out on somebody's face may however be more effective than a single image, as the element of curiosity at the blank face subsequently breaking into a somewhat humorous image may cause deeper levels of processing.

On the other hand, the value of video as an advance organiser, either to trigger background information or to provide new background information has been shown to be considerable. This would be in keeping with learning strategies in general and in particular in an autonomous or semi-autonomous learning environment where learners may not have enough linguistic competence to interpret the context of the information provided solely from its phonetic or graphemic format. This is especially true for culture specific information, and also for areas of LSP where the visual context can clarify a very specific area of language use which in real terms would rarely be divorced from its practical application.

4. The application of theory to design of a CAN8 lesson

Authoring on CAN8 is seen by many language teachers as being extremely time-consuming. However, this perception needs to be re-evaluated in the context of other authoring systems. Because the system is an authoring shell rather than a tool, the amount of time taken to create exercises is considerably less than for Authorware for example. Because it allows for integration of many different types of exercises, the lesson designed will probably be considerably more effective than an equivalent exercise using a traditional language laboratory or paper-based materials, and levels of acquisition far greater.

By creating graded types of exercises, the student moves from lower levels of engagement such as recognition to higher levels of engagement with production. The process from recognition through to production has strong acquisition-promoting features, and as long as the student has the possibility of reflecting on this process as it is on-going through automatic feedback, scoring or teacher intervention, long-term memorisation of features should occur.



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001IIntroduction       025V1               2 049V5               2 073C9
002T1Vocabulary        026V2               2 050IDevelopment qs    074A9              1
003T2Formal lang       027V3               2 051A1               2 075C10
004T3Guide             028V4               2 052A2               2 076A10             1
005TTEXT               029V5               2 053A3               2 077IExtended speak
006IMCQ                030IReading           054A4               2 078ARecord           5
007M1                2 031RText 1            055A5               2 079IExtended write
008M2                2 032IVocab test        056IRoleplay          080WWrite            5
009M3                2 033M1               2 057C1                 081IInstructions
010M4                2 034M2               2 058A1               1 082TBabylon Task
011M5                2 035M3               2 059C2                 083
012IGap-filling        036M4               2 060A2               1 084
013F1                2 037M5               2 061C3                 085
014F2                2 038IProblemsolving    062A3               1 086
015F3                2 039F1               2 063C4                 087
016F4                2 040F2               2 064A4               1 088
017F5                2 041F3               2 065C5                 089
018IListen/repeat      042F4               2 066A5               1 090
019E1                  043F5               2 067C6                 091
020E2                  044IComp. check       068A6               1 092
021E3                  045V1               2 069C7                 093
022E4                  046V2               2 070A7               1 094
023E5                  047V3               2 071C8                 095
024IAnswer             048V4               2 072A8               1 096
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Fig 2. The planning screen for a CAN 8 lesson. The letter indicates the code for the particular type of exercise which may not immediately be evident from the context. Marks attributed to each exercise in the right-hand column add up to 100% and may be kept over a term for continuous assessment purposes.

Presentation stage

Teacher screen 1: Presentation of key vocabulary occurring in lesson (or several screens with graphics for each image), with or without sound

Teacher Screen 2: Presentation of grammatical feature(s) in lesson (with or without sound)

Teacher Screen 3: Presentation of suggested path and learner strategies which might be used during this lesson

Teacher Screen 4: Authentic sound or video recording of learning material.

Recognition stage: Familiarisation with lexical and grammatical features in context. (the sound recording can remain available to the student as a reference. Graphics can be added to aid referential processing)

(M) Multiple choice questions:	a series of questions to test recognition of key vocabulary or other content
(F) Gap-filling:	a series of gapped sentences based on key vocabulary or formal language

Oral Practice stage: From repetition to production

(E) Repetition screens:	Each sentence can be repeated. A graphic display allows for comparison with an audio model to help the student analyse his own production.
(V) Speak and check:	The student pronounces a sentence, then checks the model for the correct answer. The input can be either a sentence to be read, a sentence to be translated or a question to be answered.
(R) Reading	For longer practice at the end of a lesson, the student can be required to read the entire text. The teacher must listen, mark and provide feedback.

Production without support: Evaluating and problem-solving (the sound file may be removed at this point, leaving only the graphic support or video)

(M) Multiple choice questions:	Students choose correct forms of vocabulary, meaning, spelling or morphology
(F) Gap-filling:	Comprehension type exercises where students use comprehension strategies and problem-solving skills to find correct answers
(V) Speak and check:	Simple comprehension questions can be asked. The student provides the correct answer orally and records his answer. He then checks the model answer.
(A) Answer a question:	As above, but no model answer is provided. The teacher listens in and checks.

Extended production exercises:

(C+A) Roleplay:	The student can play the role of a character in a dialogue or interact with the teacher in a pre-recorded set of questions pertaining to the area studied. Text support can be provided in the form of hints, L1 or L2 vocabulary can be provided on screen to help the student to construct answers.
(A) Extended speaking	Open speaking exercise: the student is asked to speak at some length using the language which has been learned in the lesson and record their answer. Again support can be provided in the form of an image, vocabulary, outline of what is expected etc. The teacher needs to listen and mark.
(W) Extended writing	Similar to the speaking exercise, the student writes a paragraph. The teacher reads and marks or can print out and correct.
Babylon:	this feature allows for pairwork, students are given a production task / paper –based gap information task and

have the opportunity to work together in oral interaction.

5. A re-appraisal of multimedia learning environments

While technology has led the way for creating learning environments which previously could not have been dreamed of, it is important that advances in technology do not dictate pedagogical issues. While this has already been highlighted in the design of multimedia materials, it is also important to consider the appropriateness of using multimedia materials at all. There has been some criticism of multimedia learning environments in recent times and an overview of these criticisms is revealing.

The first criticism is with regard to the depth of learning where Hannafin & Richter (1989) argue that methods used in CAL programmes typically such as

- Small learning units
- Controllable sequences
- Discrete discernible steps
- Behaviourally defined objectives and criteria

do not encourage deep mental processes.

Research by McAlpine (1996) shows that in certain conditions, learners learn better from multimedia materials than in others. He compared two groups in two different contexts and compared their reactions. The features which the high response group reported were:

- The programme was easy to use
- It fitted in well with the overall course
- It required them to think deeply about the topic
- It helped them gain an in-depth understanding of the topic.

The low response group reported opposite effects: little apparent relevance to overall coursework, did not contribute to deeper understanding etc.

He notes that this relates back to Jonassen's (1988) 4 levels of information processing strategies:

- Recall
- Integration
- Organisation of existing and new schema
- Elaboration: using and making judgements on the materials

As CAN8 materials can be authored on a week by week basis as the students require them, levels of integration far beyond those provided by ready-made CD-ROM materials can be achieved. They can tie in very precisely with the materials studied on other parts of the course.

There is also some debate on whether theories of instructional design such as those put forward by Merrill (1996) are ultimately incontestable and scientific. Wild (1996) does question them in the light of current research on the value of socially-mediated learning and collaborative learning tasks. He sees the individual working alone through a computer programme as being far from the optimal learning situation. He attempts to re-connect the concept of an artificial learning environment with real learning events, thus extending the relevance of CAL based learning materials. This belief has been re-iterated by other researchers such as Kearsley (1998) who believe that meaningful engagement in tasks can only be based on collaborative learning situations and real learning goals which go beyond the virtual environment.

Conclusion

While technology has been shown to be effective in promoting and facilitating learning, and CAN8 appears to correspond to the requirements for effective language learning in so far as it matches the requirements outlined in theoretical underpinnings, there remains an overall context which has not been resolved. If collaboration in learning is seen to be so important, then this should be even more so in the context of language learning. There remains a possibility of compromise in the context of Vygotskian learning patterns: if learning is seen to take place first of all between human beings on an inter-psychological level and subsequently internally on an intra-psychological level, multimedia learning materials may well be effective at the second stage. The challenge to make multimedia work at the inter-psychological level, attempting to simulate negotiation of meaning and understandings and a human interface, may not be worth the effort. Let multimedia do what it does well, then switch the teacher back on again and allow our learners to talk to each other, and through collaboration and discussion deepen their understanding of their chosen field.

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