Successful Adoption of CAL(L) Through Integration With Existing Courses--A Constructivist Model

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Virtually all elements of information processing systems, be they hardware, software, operating system or user interface are subject to sudden change by marketers and technicians according the needs of the purchasing public. This is true for Computer Assisted Learning (CAL) applications. These applications May became obsolete after only a year. Concurrently, the fundamental operation of these products often changes, making writings on the operation of specific products relevant for only a brief period of time.

Fortunately, for the educator interested in the design or acquisition of CAL at any level-from a homepage used for a single lesson to a CAL network or interactive CD-ROM series to support an entire curriculum - there are principles and considerations in design and adoption of educational materials which transcend the advance of technology. This writing seeks to cover many of these considerations and principles and make recommendations for implementation of CALL in the field of Teaching English to Speakers of Other Languages (TESOL).

I. Common hurdles in CAL(L) development or acquisition

Aside from the obvious problems which poor software quality and lack of technical support create, other hurdles exist which must be overcome for the effective long term success of CAL design or adoption. These must be given careful consideration and dealt with when proposed to budgeting authorities.

According to Baker, 'perhaps the greatest institutional deterrent' to progress in the field of CAL is "lack of awareness and commitment among tertiary teachers to a technology which promises to revolutionize their professional lives." (Baker 1996, 3/8) Additionally, because CAL educational models differ significantly from the traditional teacher-centered model, there is a great need for support to assist students and staff with the transition. A lack of support during this transition, "rates among the strong influences on the slow pace of development and change, and underlies the argument for a 'bottom up' approach to the process." (Baker 1996, 3/8)

Low investment in CAL development or acquisition resources is perhaps the most common short-term obstacle. To overcome this hurdle, relevant staff will need to provide sufficient data on successes of CAL resources in question in learning contexts similar to those relevant at their own institution. The proposal should also include results of research on past technological problems in similar contexts, effective solutions and detailing of the benefits of CAL.

A CAL device may initially be put into use. due to 'failure to allocate time for staff to research the use of new teaching technologies' However, due to staff's lack of awareness of potential benefits or proper use of the application, its popularity will likely dwindle. Training seminars for all relevant staff and learners should be included in all budget-related CAL proposals. Two additional related problems, 'refusal to consider achievements of this nature as equal to publication points for promotion purposes,' and 'to accept developments in the field as valid research for funding purposes,' may dampen individual and group enthusiasm. Gunn and Perry (1996, p.2 of 8) summarize the root of these problems:

> Another major problem is the low status (read "and salary") of many technical staff involved in educational software development in comparison to their counterparts in the commercial world. As instructional designers and multimedia developers, these individuals are expected to understand, and even sometimes to perform the functions of an academic. Often they are required to be equally well qualified, as well as proficient in graphic design, programming, needs analysis and systems design. While the status of these positions remains ambiguous, it will be hard to recruit and keep good staff in educational multimedia development positions. The problem in this respect may lie in the lack of awareness among management of the significant functions these new positions fulfil.

Perhaps the only solutions are constant promotion of awareness of the complexity of the jobs CAL experts have before them and for all CAL related proposals to recommend specific earmarking of funds and awarding of publication points to these individuals.

What is likely the most complex problem lies in the resistance which often occurs when CAL resources show only loose correlation with established courses, tests and other programs which seek to enhance learning and motivate learners.

The problem is illustrated with the comment:

> "Only occasionally is there a clear correspondence between an exam item and a

piece of CAL." (Baker on Draper, Brown et al., 1996).

While it is not suggested that exams should be the sole test of knowledge of the course content, they are, not surprisingly, a well-known motivational force for students. (Baker 1996, p.2 of 8)

This type of problem is easily overcome for the teacher designing or adopting CAL for his /her own curriculum. However, when the scale is that of an entire department or institution, careful curriculum integration and consideration of motivational factors prior to design or adoption may require hour upon hour of consultation with staff, but is an absolute necessity if CAL is to be accepted for long term integration. Sapporo Gakuin University (Japan) is considering a simple form of integration which consists of annual progress tests for which students may receive extra credit. These progress tests consist of content derived from all English as a Foreign Language (EFL) classes. Sapporo Gakuin is designing CALL software which allows students to drill themselves on vocabulary found in the integrated material. To further strengthen the motivational effect, it is proposed that the material also be included on extra-credit progress tests - a fact that students will be consistently reminded of. In the plan, both careful correspondences with existing course content and exam items have been incorporated.

While attention to the problems detailed in this section will increase the likelihood for success of CAL, these are no substitutes for careful adaptation to the special needs and characteristics of the each class, department and institution to be affected. The following section focuses more closely on specific contextual elements and context-specific evaluation.

II. Design or adoption mindful of context

Sound physical design and post-design support of CAL are undeniable necessities, the lack of which has seen many a good CAL program 'bite the dust.' However, perhaps of equal detriment is 'CAL which is well designed, educationally sound and accessible to students,' but which is the victim of poor integration strategies, either at the institutional or classroom level (Unnamed CPD, 1998, p.2 of 4).

Any CAL design or acquisition performed without careful consideration of the context (both product-related and situational factors) is unlikely to be received with enthusiasm. "Evaluation in context refers to study of the primary effects of CAL programs used in an integrated manner with other learning resources and support such as lectures, textbooks, tutorials etc." and 'study of the primary effects of CAL programs.' (Unnamed CPD 1998, p.2 of 4) "Evaluation of context," concerns evaluation of factors which may not even be directly related to the targeted

CAL program or immediate learning environment. Nonetheless, they are factors "which can still represent significant influences on integration and learning outcomes." For example, prevailing levels of institutional support for acquisition, development and use of CAL. (Unnamed CPD 1998, p.2 of 4)

The University of Auckland's CPD Home Page supports a "situated evaluation of CAL" or SECAL:

The SECAL framework includes consideration of contextual factors because it is accepted that these can affect the use and therefore the impact of CAL. The critical approach of SECAL requires examination of the bigger picture, to include e.g. institutional factors that might influence culture, attitudes and acceptance of new ways of teaching and learning. Research suggests that the educational impact of CAL is likely to be at least partly dependent on such factors, (Unnamed CPD 1998, 2 of 4 on Darby, 1992, Hammond, 1992, Geoghegan, 1994). The relative importance of each element is situation specific and determined by the nature of the evaluation and the interests being served. Weighting each element according to its relevance in any particular case easily customizes the evaluation framework. The central feature of the SECAL framework is a definition of effective learning for the focus domain and statement of the means of assessing its achievement. Assumptions about effective learning and how it can be measured have their basis in educational theory, and may include metacognitive aspects as well as subject specific factors. (Unnamed CPD, 1998, p. 2/4 on Ramsden, 1988).

Educators might construct their own contextual evaluation based on SECAL's elements, which are:

●Defining learning objectives and measuring achievement - 'definition of effective learning for the focus domain' and the means of 'assessing its achievement'
●Hardware and software issues - "generally those of accessibility, performance, complexity and support"
●Effective use of technology - Does the application offer 'enhanced presentation or communication options', 'enriched implementation of effective instructional strategies' or both? Based on what theory (ies) of learning?
●Quality of software design - Usability, 'based on sound instructional strategy, subject coverage

and presentation, inclusion of motivational factors and functionality.'

●The learning environment - 'Provision of learning resources and support systems to suit a range of individual styles, aspects of institutional support, levels of staff and student confidence and general organizational culture.'

●Classroom culture - As CAL by nature requires learners to be independent and "there is no current study culture for learning from CAL and no familiar methods for students to use," Because of this, evaluation of local cultural characteristics is required.

●Learner support - Needs in this area,"Vary according to factors such as the level of subject coverage and the place of CAL within a course."

●Motivational factors - CAL must be linked to 'required learner actions and educational objectives and goals.'

●Integration issues - If CAL is an 'optional extra,' or if staff are not committed or encouraged to be committed to technological advances, it is unlikely to be taken seriously (Unnamed CPD, 1998, p.2 of 4 - 4 of 4)

While there are likely other elements to effective contextual evaluation, SECAL's elements provide a sufficient basis for creation of an initial contextual evaluation. As consultations and deliberations proceed, additional areas of evaluation will likely become clear.

Up to now, this writing has been concerned with institutional and contextual benefits, obstacles and integration. The following two sections are more closely related to the actual design of interactive applications.

Ⅲ. Ultimate Goals for CAL(L) in TESOL: multimedia & constructivism

To this point, this writing has been concerned with considerations in the design and acquisition of CAL and has not attended to specific learning theories or CAL media types. However, designers or adopters of CAL will often need to justify their CAL work or decisions with learning theory (ies) as related to the media type(s) included in CAL. This section argues the need for the following two elements in Computer Assisted Language Learning (CALL):

1) Constructivist instructional design and

2) Multimedia integrated into existing courses

The Communicative language skill is perhaps the least successful of any subject taught

through induction. Language was indeed created out of unresolved need and continuously evolves through myriad needs resolved through its use. CAL,whose design is based on constructivist theory,best replicates this process.

Basic tenets of constructivist theory are:

Knowledge construction relies on active mental processing of perceptions. It results in understanding, which results from generative processing. That is, knowledge construction is a generative learning process (Jonassen, Mayes and McAleese, 1998, p.2 on Whittock, 1974). Generative processing involves relating new information to prior knowledge in order to build more elaborate knowledge structures. These knowledge structures are necessary for interpreting new information, reasoning from what is known, and for solving problems. Indeed superior learning results from material that has been acted upon, and the finding that material is better remembered if it is actually generated by the learner (rather than the equivalent material being presented to the learner) has been termed the generation effect. (Jonassen, Mayes and McAleese, 1998, p.2)

While inductive learning may be inevitable at the beginning, learners should be involved in a progressive increase of lauguage creation and problem solving activities in which they are resolving needs with language and generating new webs of knowledge and communicative ability.

Jonassen, Mayes and McAleese explain the transition:

Since each phase of knowledge acquisition entails different types of learning, each also suggests different approaches to learning. We believe that the initial knowledge acquisition phase is better served by instructional techniques that are based upon classical instructional design techniques. Classical instructional design is predicated upon predetermined learning outcomes, constrained and sequential instructional interactions and criterion referenced evaluation. We believe that constructivist learning environments are generally more viable approaches for the second, advanced knowledge acquisition phase ...At the end of the learning process, experts need very little instructional support and will likely be surfeited by the rich level of instructional support provided by most constructivist environments. (Jonassen, Mayes and McAleese, 1998, p.2)

How might constructivist theory be best applied to CALL application in second and foreign language teaching? The most important task which CALL must achieve is connection with situations of use which learners feel are relevant. At the beginner level, this does not equal avoidance of induction of individual items and structure. However, at every point there should be clear connection to real like situations. Moreover, learners at every stage of the process should be exposed to exercises in which they attempt to produce language (e.g., through conversation, or writing) using the items already learned to attempt creation of language for use in novel situations. Gunn explains further:

> The 1990's will be remembered for the advent of the high powered multimedia desktop computer, virtual reality and the Internet. Developments associated with this phase have been labeled 'integrated CALL' and involve placing the learner in close to authentic situations where learning simultaneously involves listening, seeing, reflecting, doing and participating. (Gunn, 1997 B, p. 2 of 6)

This is the challenge to CALL for the future, for as yet there are no applications which allow correction or interpretation of a broad range of student input. However, this does not imply that CALL has no use in language learning. CALL may be used as a tool for exposure to language in various simulated situations and may be used to correct certain written answers (e.g., multiple choice and fill-in-the-blank).

Where CALL may fit the demands of the constructivists is through inclusion of assignments which ask students to collaborate with other learners in language construction and use after exposure to relevant and realistic situations . In addition, CALL may be effective at sending students off to find resources which match both the material in CALL modules and their own individual needs and interests through access of other sources of information in the classroom, institution, the community at large or the Internet.

The CAL system which seems to be gaining rapid popularity, and the one which this writing recommends, is multimedia representations (especially video) of realistic communication situations integrated into existing courses (see Sapporo Gakuin University's integration strategy above). Gunn found that, "the quality of learning outcomes is consistently high when a multimedia element is included in courses." (Gunn 1997 B, p.3 of 6)

Aside from being the most effective venue for constructivist learning, multimedia, including text, radio, broadcast TV, audio and video tape,"render the learning experience...as true to life as possible and assist students in developing the necessary independent study skills." (Gunn,

1997 B on Brussino, 1996) Not only would multimedia CAL likely be the next best thing to actual immersion in the L 2 environment, It would accommodate all three types of learners: visual, auditory and kinesthetic.

Ⅳ. Conclusion

This writing has advocated incorporation of resources and support systems to suit a range of individual iearning styles, aspects of institutional support, levels of staff and student confidence and general organizational culture as a first step to achieving the full benefits of CAL(L). It has also been a main objective to inform anyone ranging from individual teachers to large institutions of considerations in the design and adoption of CAL. An additional point made by this writing has been that careful consideration of and adaptation of CAL materials to all levels of the educational context is imperitive to the long-term integration of CAL. This point was driven home through a look at common hurdles to CAL design and adoption and elements of evaluation. This writing has also made clear that truly interactive (or even partially interactive) CAL applications are rare and involve a lot of work or expense for effective creation and adaptation.

Finally, as a path to long term CAL acceptance, this writing has encouraged adoption of multimedia-based CAL applications integrated with existing courses, based on real life situations and constructivist learning theory.

Researching CAL design and adoption is a complex domain of Information Technology. This writing has sought to cover many of the fundamentals of the subject. However, there are many areas such as modulation of learning material into CAL format(s), detailed theories of learning applicable to CAL, authoring applications and the intricacies of the technical aspects of CAL design which have not been covered here. For the interested researcher, there is an abundance of material on these subjects which may be found either on line or in traditional form.

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