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Social constructivism and CALL: evaluating some interactive features of network-based authoring tools

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Abstract

A quality-based authoring tool is defined by its ability to satisfy its users' needs. In the design and use of such tools in CALL, however, very little reliable information exists about what the tutoring system really does, for example concerning its capacity to create 'interactive' lessons. Linked to this, many teachers lack the time and resources to keep up with the latest technological developments, and invariably feel they are under exploiting the possibilities of CALL. This paper proposes a typology of different types of CALL-based interactivity and interaction to help teachers better assess the possibilities of network-based multimedia authoring tools. In adopting a general social constructivist approach, the system of classification looks at how one can link different learning styles, in this case that of Mumford & Honey (1992) Learning Styles, to different types of: (1) on-line learner accompaniment; (2) evaluation of learner production; (3) organised structures of events/states (scenation); (4) data organisation; (5) information units; (6) frequency of choice; (7) choices made available to learners. Finally, a multimedia authoring system, *LEM* of *Speaker* (Intranet version 3.30) will serve as a demonstration of the importance of this mode of evaluation to the design and understanding of such authoring tools in CALL.

1 Introduction

With increasing access to Web technology, many teachers wanting to develop Computer Assisted Language Learning (CALL) find themselves overwhelmed with the prospect of having to keep abreast with advances in course-writing, graphic design, editing, publishing, etc. (see a recent survey by Parhar & Mishra [2000] on this subject). Indeed, a certain level of literacy in these fields is necessary, given the new possibilities made available with the rapid pace of technological innovation and the growing need for made-to-measure on-line courses. The difficulty is that teachers have little time and resources to update their authoring skills to make full use of advances in CALL. What is needed is an approach that summarises the essentials of what CALL has to offer, in this case the interactive quality of tutoring via computer-based networks.

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As McLuhan (1964:23,33–35,91,95) points out, each type of technology is an extension of the power and speed of users' physical and nervous systems, and in so doing it alters their perceptions of space, ratios and interrelationships. To study these possible effects on the tutoring/learning process, it is useful to identify the 'interactive' features of the proposed technology. It is on this point that this paper will be based in order to fill an apparent gap in present day CALL research regarding the range of 'interactivity' and 'interaction' in network-based multimedia.

We will start by highlighting the differences between the related concepts of interactivity and interaction. Then follows an outline of Mumford and Honey's description of probable learning styles concerning adult learners. This is followed by a classification of the range of 'pedagogic interactions' linked to CALL, before we go on to examine how different types of learners' output can be considered as evidence of probable significant cognitive interactivity. Then follows a five-part analysis using the *scenistic* approach to classify interactive features provided by the scenario, before we go on to look at the different frequencies and range of choice offered to learners. Finally, some implications for CALL are raised.

2 Interactivity and interaction

As background to this paper, it is necessary to be clear about what is meant by online interactivity and the related, but distinct, concept of interaction. In a detailed article on interactivity in educational computing, Rose (1999:47–48) equates learner control with interactivity. Similarly, Smith (1999) defines the concept in the following way:

> Interactivity with the narration allows us to change perspective and sequence events, and select goals … Interactivity with objects depends on what we do to the objects, how they can respond, what they can do for us (Smith, 1999:26).

In short, interactivity is one of the functions of the system that responds in various degrees to the actions of the learner. Smith goes on to point out that 'interactivity' is not an end in itself.

> Learning how to describe the nature of (computer-generated) interactivity is a useful starting place for the real work of analysis: examining the details of the text or of the particular interaction between a (user) and a CD-ROM text (Smith, 1999:29).

Concerning the concept of interaction, Goffman (1974:7) defines the phenomenon as linked to the 'simultaneous presence' (co-presence) of social actors in the same situation involved in the co-construction of the message via a series of mutual retroactive and proactive adjustments. In this context, an interaction involves a mutual exchange of data[1] by participants based on their acceptance of common norms (a 'contract') which they negotiate and manage by producing meaningful signs in attempting to synchronise

[1] i.e. a numerical record of a given characteristic of an object or event in a form (code) accessible to a given social group.

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(principle of co-operation) their discourse and gestures (adapted from Maingueneau, 1996:49). It is in this sense that the phenomenon of interaction possesses its own dynamics in which the participants are both its co-creators and its products in a given social context. In short, the phenomenon of interaction represents a key element in what can be called a 'social constructivist' approach to learning and communication.

3 Dominant learning styles

For CALL to be effective, materials designers need to make explicit their model of how they see (different 'types' of) learners interact with the system. This underlying model represents a selection of given elements that interests the author, and which are necessarily limited as one cannot give to users all they desire, if nothing else for logistical reasons. Hence the need to carefully weigh up which features of, for example, learner needs, representations and preferred ways of learning (learning style) are to be included in the model.

The difficulty here is that there is a multitude of inventories of learning styles to choose from, with varying degrees of experimental validity. What most of them have in common, however, is the fact that such inventories are guides as to what may be going on in the learning process, rather than being prescriptive techniques or absolute realities. In this context, an often used approach is that of Mumford & Honey (1992) who propose an inventory of learning styles.

Type 3.0 Conformists
Though not directly mentioned by Mumford and Honey, there exists a type of learner that tries to apply to the letter what has been taught by making little attempt to personalise or take initiative in the learning process. With this approach the person tends to rely on rote learning and to be highly dependent on the designated expert/teacher.

Type 3.1 Reflectives
They prefer to think things through before responding, and this can make them appear hesitant. They can be identified in their quest for more information before giving their answer. This can include gathering different opinions, and observing how other people go about fulfilling given tasks. In doing this they like sharing and learning with others, but tend to overlook the more practical aspects of their insights. The tutor intervenes mainly to suggest appropriate resources and the practical implications of their findings.

Type 3.2 Pragmatists
These learners are willing to be shown how to do things but on the condition that they can put into practice immediately what they have learnt so as to resolve a particular 'problem'. They tend to focus on how to improve what exists by looking for less obvious possibilities. They come across as energetic, confident and keen to take up the challenge of finding answers. The tutor's role is to encourage them to get started with the necessary information needed for a given task and to share their insights.

Type 3.3 Theorisers
Their approach is based on curiosity and questioning what they are told/taught (e.g. What

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does it mean? Why must it be done in this way?). The approach is often systematic and linear, and invariably starts from first principles in order to understand the overall picture. They try to be detached and are sceptical of personal opinions. To do this they use individual cases to construct a general system of rules. Diagrams are often used to show the link between different elements. The tutor is often led to helping them make explicit their reasons for achieving their goals and preventing them from getting lost in the 'secondary' details of the task.

Type 3.4 Activists
Their identifying characteristic is their impatience to get on with the job straight away, without waiting to be shown how things work. They prefer to find things out for themselves and tend to be quickly bored by the slower work of consolidation and implementation. These learners also take the initiative, and opt for activities with short-term goals. They give spontaneous responses and, in their enthusiasm for new experiences, they can end up tackling non-relevant or secondary questions in terms of the initially set objectives. In this sense, Activists tend to be the least teacher-dependent in needing to try out, on their own initiative, a number of (non-recommended) alternatives and goals at the possible risk of a certain lack of efficacy. The tutor's role is to ensure that learners do not get too isolated by their reticence to consider insights and advice from other people and to remind them of their initial objectives.

4 The human network

The contribution of researchers like Vygotsky (1934/1962:101–04) stresses the pivotal role of active external agents, like teachers and 'pedagogic' tools and techniques, to shape and transform the mental development of learners at certain critical moments in the learning process (cf. the 'zone of proximal development'). This implies a series of timely pedagogic interactions between learners and the teacher. A more recent approach underlines the need for the negotiation of meaning between peers (collaboration between non-experts) which can in itself lead to further knowledge (e.g. Legutke & Thomas, 1991:276–79). Learning thus happens when the learner is part of an active and creative network of (human) interaction in a particular social context (learning via communication). This implies the need for a system of learner accompaniment via different types of interchange to facilitate the learning process; cf. Bateson's (1977) metaphor of the orchestra to illustrate the inevitable social and creative dynamics of the 'communication process' in the process of learning about oneself and the world. In terms of CALL, this approach to learning suggests the following classification.

Type 4.0 No help
The user is expected not to have any major difficulties or is able to find help without wanting any explicit help. This is likely to be more appropriate for an *Activist*-oriented style of learning (Type 3.4).

Type 4.1 Built-in help
The designer anticipates the user's questions and integrates the solutions within the product itself based on exchanges between the user and the machine. This help mode

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represents contact with a tutor *in absentia*. It can take the form of pre-established glossaries and a dictionary. The learner is limited to the product designer's choice of questions and solutions. Normally, it is up to users to find out how and when to best use these 'help' features. This would seem particularly apt for a *Reflective*-oriented style of learning (Type 3.1).

Type 4.2 Peer contact
This can facilitate learning by collaborative and co-operative activities in which the externalising of ideas and feelings helps participants (*viz. Pragmatists*/Type 3.2) discover alternative ways of satisfying their learning needs (horizontal collaboration). For instance, learning a language via email partnerships where learners with different native languages can exchange information, suggest corrections to each other's target language, and ask for clarification about various elements of the other culture (e.g. Labour, 1999). One advantage of this system is the possibility of self-management, especially among more autonomous learners.

Type 4.3 Reactive contact
It is up to the learner to take the initiative to contact the tutor (learner-led vertical collaboration). Access to the tutor can be on-line, by email, in a chat room, or off-line. The learner must not only be aware of having a question to ask, but must also want to make the effort to find a solution with the help of someone with greater expertise, in this case a readily available mentor. However, from a language learning point of view, a certain level of tolerance of ambiguity and incompleteness of knowledge is sometimes needed (cf. Naiman *et al.*, 1978). This implies that learners need to know when a question is conducive to achieving their objectives and when it is not. Not to do this may lead learners either not to ask any questions or to ask so many questions that they become sidetracked from their initial learning objectives (*viz*. *Theorisers*/Type 3.3).

Type 4.4 Proactive contact
This type of interchange already exists in the traditional language laboratory where the teacher can take the initiative to intervene at the appropriate moment while the student is at work (tutor-led vertical collaboration). To do this, however, the tutor must observe ('listen in' to) the learner at work and then step in at the right moment to encourage the learner or to suggest corrections. With this proactive approach some learners (*viz. Conformists*/Type 3.1, *Reflectives*/Type 3.1) may feel reassured that they have not been left to their own devices, while others (*viz*. *Activists*/Type 3.4) may see tutor intervention as tutor intrusion.

Having completed this first category of classification (see Figure 1) of the different types of learner accompaniment, it would now be useful to look at how one can assess the effectiveness of a system in facilitating cognitive interactivity.

5 Evaluating learner output

One of the aims of evaluating learner output is to assess the effectiveness of certain types of probable cognitive interactivity via computer-mediated activities. In this sense,

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cognitive interactivity involves mental activity to do with data acquisition, storage, retrieval and use in a given context, as well as interactions on itself (Tricot & Rouet, 1998:7). In terms of learning this implies that, on the one hand, learners can be encouraged to monitor the efficiency of their mental processes in achieving practical, set goals (*result-oriented* metacognition) and on the other hand, learners can be helped to be aware of their own cognitive 'tendencies' (*e.g.* techniques of memorisation, problem solving tactics) of processing data (*process-oriented* metacognition). In the light of this, a classification is proposed in terms of evaluating certain learner output as a probable sign of significant cognitive interactivity.

Type 5. 0 Read/listen

The learner receives the data but there is no related activity to ensure that the data have been successfully processed.

Type 5.1 Binary feedback

Each item of learner output (e.g. filling in blanks) is evaluated by either a right or wrong response. No other comment or information is given to the learner. The emphasis here is on result-oriented metacognition.

Type 5.2 Record keeping

A global score is calculated for work done, often accompanied with associated sub-scores. This allows learners to have an idea of their rate of progress (and in which domains). This function can also include record keeping of work done and that which needs to be done, i.e. an (automatic or semi-automatic) electronic logbook.

Type 5.3 Template

This type of evaluation involves a complex process of comparing the learner's answer with that of the 'teachers', permitting a certain amount of flexibility as to the correctness (appropriateness) of the answer.

This can be done by speech recognition functions or wave form oscilographs for oral expression, or by making model answers available to written work (with explanations of

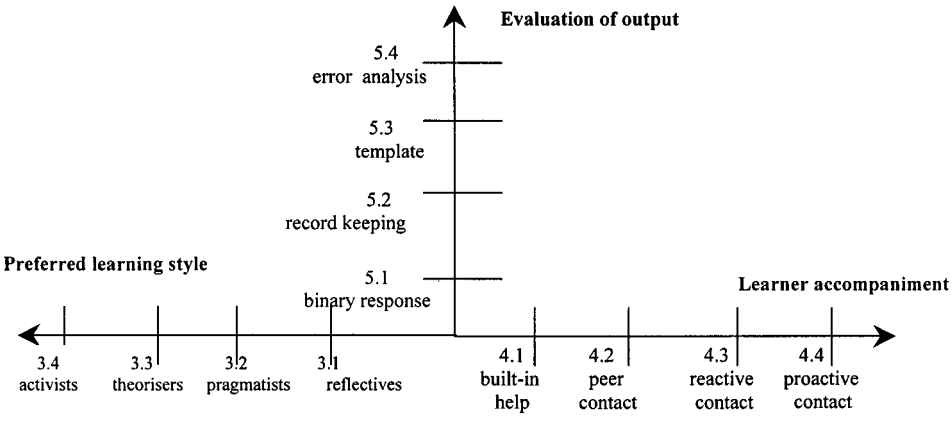


Fig. 1. Learning styles, evaluation of output and learner accompaniment.

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areas of possible difficulties). For example, learners can record their voice and compare it with a model (template) to evaluate the degree to which various interconnecting elements (e.g. a word) of a given answer fits in within a general whole (e.g. in a sentence).

Type 5.4 Error analysis
This involves giving learners a pedagogic explanation for specific types of errors. Each error has a different type of response to make the learner aware of why the mistake was probably made. This type of feedback tends to encourage process-oriented metareflection.

To summarise the role of interpersonal communication and cognitive interactivity in language learning, Figure 1 presents these features along three axes.

We have seen how the concepts of interpersonal and cognitive interactivity can be operationalised; the challenge, however, is not in making these resources available in a haphazard way, but as part of a coherent whole, that is *when a learning resource is most likely to be useful to the learner*. It may be that different activities are of high technical quality but lack the necessary overall interconnections to facilitate appropriate learning. After all, knowing that a learning tool has different pedagogic features, like speech recognition or a pedagogic oscillograph[2] does not tell us how they are linked to other activities of a lesson. Not to look at the overall coherence of the lesson may lead to cognitive overload or to other forms of dysfunctions such as learners losing sight of their priorities and needs. One way that these learning resources can be co-ordinated to facilitate the learning process is by a carefully designed interactive scenario. In the discussion that follows, the role of the scenario will be examined in some detail.

6 Role of the scenario

In an extensive study into designing effective multimedia texts, Leleu-Merviel (1996) proposes a 'scenistic' analysis of the interactive quality of the scenario in determining what information is given to the user and the way this is done. In this context, a 'scenario' is defined as a deliberately thought-out text that has a story-line, technical details, the author's intention, a target audience, and a message. From this point of view, the concept of interactivity implies a scenario which anticipates the various responses of the user that are oriented in a particular direction by a 'scenational schema', or a series of pre-planned events/states linked together by different paths for the user to take. In this way, with each interactive session the user can follow a different path. Thus when evaluating the 'interactive' quality of a CALL environment it is important to closely examine the choices the system gives to the learner. In this context, Laubin, Durand & Leleu-

[2]e.g. the software WinPitch LTL (*Language Learning and Teaching*) provides a real time analysis of speech, and speech visualisation and synthesising (www.winpitch.com) cf. German & Martin (2000:61–76). (http://alsic.univ-fcomte.fr/Num5/germain/defaut.htm). Consulted July 2000. Alain Cazade offers a telling analysis of the existing limits of current speech analysis systems cf. Cazade (1999: 3–32) (http://alsic.univ-fcomte.fr/Num4/cazade/defaut.htm). Consulted March 2000.

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Merviel (1999) propose a classification based along three axes:

- the interactive nature of the scenario (scenation),
- the generative nature of the data,
- the openness of information units.

Before examining these categories more closely, it is important to emphasise that a product can be described on various levels and is never limited to only one level. The thrust of the classification will ultimately depend on the needs of the learning context, and this may downplay other (predominant) features that can be classified into other categories.

7 The interactive nature of the scenario (the 'scenational' element)

Type 7.0 Linear non-interruptible / audio-vision (e.g. cinema)
The system works independently of the reactions of the user (sit back and enjoy). While there is no direct interactivity with the user, there may be concomitant cognitive, emotional or social interactivity.

Type 7.1 Linear interruptible / reading (e.g. video recorder, a book)
Users can stop the text, skip sections and carry on as they please, or sometimes go back to reread the text. Essentially, however, the text remains linear and users have limited control in the way the content is presented.

Type 7.2 Menu-based navigation (e.g. 'straightforward' database)
The navigation is done by a series of limited choices offered by a predetermined menu. The arborscent structure of the navigation offers little possibility of undoing the choice (unidirectional navigation), except if a previous choice has been copied and pasted ('cloned') in a successive phase.

Type 7.3 Multiple-criteria exploration (e.g. train time table)
Multi-criteria requests can be made, as at each step the choice is multidimensional. Users enter different criteria and then select what corresponds to their needs. In reality, it can be difficult to establish if a product is mainly Type 7.2 or 7.3 as it may take too long (40–60 hours) to look at everything in the product. So one has to assess a sample of features.

Type 7.4 Free exploration (e.g. networks like the *World Wide Web*)
The exploration is less predictable. The user is not limited to predetermined paths. From a given entry point, networks of interconnected links allow the learner to create individualised paths that may not have been foreseen by the creator of the system. One can go back and forth along different paths that include segments of other greater routes. One can therefore jump in and out of different categories (help page, index page, news pages, etc.) unlike a strict arborscent route (Type 7.2).

Type 7.5 Virtual visit (e.g. virtual/3-dimensional reality)
Users are fully immersed in a near continuous interactive universe, and choices are

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made by trial and error as they work their way through the system. The whole system depends on the continued action of users as if they are part of the same space as that of the electronic universe. In this type of 3-D space there is direct manipulation of objects without having to learn external metaphors. The quality is judged not by the richness of the 'scenario' (different messages that can be sent and received) but by the quality of the 'events' (data flow).

8 The generative nature of the data

The preparation of a 'document' (i.e. the organised structure of content) involves the judicious choice of data and organising them in a given structure. It is the 'type' of data and the way they have been organised that determines the different 'scenational' modes.

Type 8.0 Fixed data
Choices and solutions are rigidly predetermined. There is no possibility of modifying data other than the way they are initially presented. Every time the application is used the user is exposed to exactly the same content in exactly the same way.

Type 8.1 Basic automatic start up generativity
There is an automatic, machine-generated selection of parameters at the start of the work session, independent of the action of the user. This feature adds a factor of initial unpredictability to the learning task. There is no way, however, for the user to know on what basis the selection of the new data is done as the controlling variables are embedded in the programming codes.

Type 8.2 Basic user-driven start up generativity
Users decide at the start of the work session which features and parameters they wish to activate (e.g. level of difficulty). One thus has access to some of the parameters of the proposed activity. This makes evaluation of the learners' performance clearer than Type 8.1.

Type 8.3 Basic automatic dynamic generativity *during* use
The system automatically modifies the variables at the start and during the work session without the user being able to directly control the process. This can add an element of unpredictability and realism to learning activities. That said, it also makes evaluation of progress more complex as one does not know on what basis the selection of the data was done in a given working session.

Type 8.4 Basic user-driven dynamic generativity *during* use
The user can modify the parameters at the start and during the work session. The modification depends directly on the user's choice. The user's output and scores are easier to measure here than that of Type 8.3.

9 The openness of information units

It is often the case that data do not have meaning in themselves, but depend on their semantic links with other data. This happens when it is sometimes necessary to unclip

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and reclip (regroup) different data together to achieve a given objective.

Type 9.0 Totally integrated fusion

Information units are inseparable from their original context (e.g. html environment) context and they form one integrated whole (with no sub-component parts) e.g. a 'standard' photograph.

Type 9.1 Indivisible and context-bound

Information units can be organised in different ways (e.g. the various parts of a diagram of a motor car) providing the units are not exported from their original context (e.g. html environment) to another one (e.g. the Windows-Word environment). One can reassemble the information units (e.g. displacing the different parts of a face in a specially made photograph) but one *cannot break them* down any further to create new (smaller, bigger, different) information units.

Type 9.2 Divisible and context-bound

Information units can be broken down into sub-component parts and reorganised in a different way but only within the initial context. For example, the different elements of a Web page can be selected and copied in various states only onto another Web page.

Type 9.3 Indivisible and transportable

Information units cannot be broken down any further but can be exported to other contexts that are different from the initial one, for example from a Web page to a word processor page.

Type 9.4 Divisible & transportable

Information units can be broken down into their component parts and transported from their original context to a different context.

The role of the scenario in encouraging interactivity and interaction between the user and the presentation of the learning content can be represented on a graph as shown in Figure 2.

Besides the different levels of interactivity linked to the planning of the document, there is also a more overall aspect of interactivity linked to the range of choice given to the learner by the scenario. For the purpose of our analysis, two further elements can be added to the typology, namely the frequency of choice and the amount of choice available to the learner at any given moment.

10 Frequency of choice

The frequency of choice is linked to the pace (slow / fast) at which learners can select and change activities. This involves the way the system interacts with the learner at a given tempo.

Type 10.0 Isolated choices

No explicit help or guidance is offered to learners as to when or at what pace a given activity should be done. There is no real sense of pace in the teaching/learning

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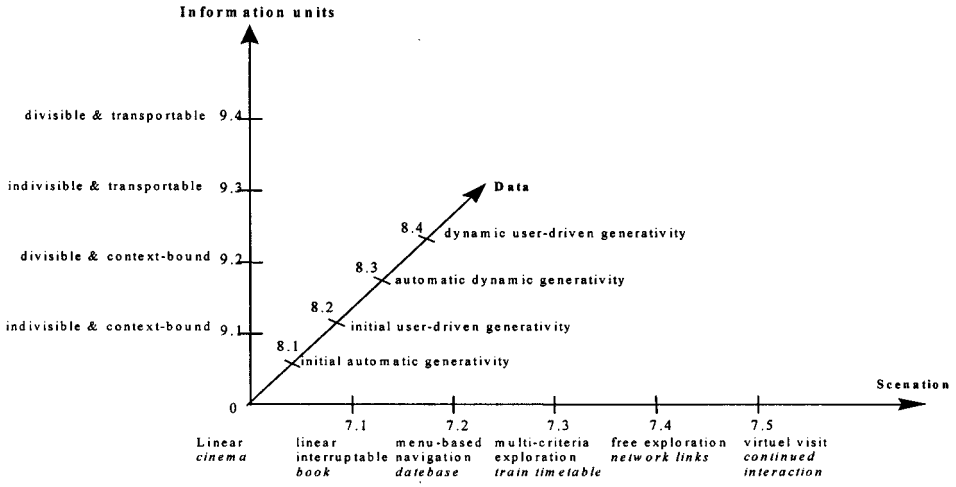


Fig. 2. The degree of interactivity in a computer-based scenario.

system. In this context, learners are isolated (closed off) in not being encouraged to construct their learning with the direct help of the tutoring system or other pedagogic resources.

Type 10.1 Pre-set choices

After a given result is achieved, pre-set choices are offered to learners. This demands a certain level of patience and tenacity to work towards a set objective via a predetermined teaching/learning 'tunnel', which may or may not have a time lapse. The learner often has little sense of how fast the pace will be. A well adapted exercise may mean that the pace is not too hurried, to allow some reflection. An exception to this may be the case of assessing the learner's competence where the capacity to reply quickly and accurately is one of the measures of success.

Type 10.2 Guided choices

This system offers guided choices to learners during the teaching/learning session. The tempo is determined by the learner. The main difference with 10.0 is that learners are guided in terms of, for example, the objectives and (linguistic) demands of available activities.

Type 10.3 Reactive choices

This can be characterised as relatively fast moving and 'open', where the pace is directly determined by what the learner does (e.g. the electronic white-board) in reacting, or adapting, to the resources of the system. Learners have to think before they act, as each action has a direct consequence on how the components of the system will respond, and vice versa.

11 Range of choice

A CALL system can also be evaluated according to the low or high amount of choice

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that is available to the learner. At this level, the choice occurs in the selection of different types of computer-supported pedagogic activities (cloze exercises, multiple choice questions, etc.). This range of choice can be important to allow learners to choose how they wish to deal with a certain linguistic element or theme. It may also permit the learner to go over the same subject area in different ways (e.g. the video instead of a sound document).

Type 11. 0 Single choice
Learners have no other possibility than the one proposed to them by the tutoring system.

Type 11.1 Dual choice
In general, two types of activities (e.g. cloze exercise and multiple choice questions) are made available to learners. Such a system often permits the learner to go back and try the other proposed alternative. This strategy may be useful as a form of reinforcement, for example with learners having a more *Reflective* learning style (Type 3.1).

Type 11.2 Multiple choice
In general, learners are faced with three or four possibilities. Learners are guided along without having to spend too much time (re)selecting which paths to take.

Type 11.3 Varied choice
Learners can find themselves with a mixture of limited and broad choices (to bring, for example, a certain variety to the learning process). This can be a bit unsettling for some learners whose learning style may depend on a steady working pace, e.g. the *Conformist* learning style, Type 3.0 .

Type 11.4 Large choice
Each time there is a choice, five or more alternatives are made available. For most learners there is either not enough time or motivation to do all the activities offered. Learners are thus put in a position to assume their initial choice (without being made to feel they must go back and try all the other alternatives).

The frequency and the range of choice is illustrated by Figure 3. The different types of interactivity cited in this paper can be represented globally by the following graph (Figure 4). It attempts to illustrate the usefulness of our approach via the authoring system *LEM* (*Laboratoire d'Enseignement Multimédia*) of the educational software *Speaker* (version 3.30, published by *Neuro Concept*,[3] Paris) by evaluating it in terms of its capacity to produce an interactive tutoring system.

One of the striking features of Figure 4 is that the authoring tool tends to favours the *Reflective* (Type 3.1) and *Pragmatist* (Type 3.2) learning styles. In effect, a study of adults learning English at the Université de Valenciennes does show that a dominant proportion of adults learning English as a Foreign Language (EFL) see themselves essentially as *Reflectives* (Type 3.1). However, a significant number of learners also consider themselves as *Theorisers* (Type 3.3). Yet, a tutoring system like *LEM-Speaker*

[3]cf. http://neuroconcept.com/english.htm

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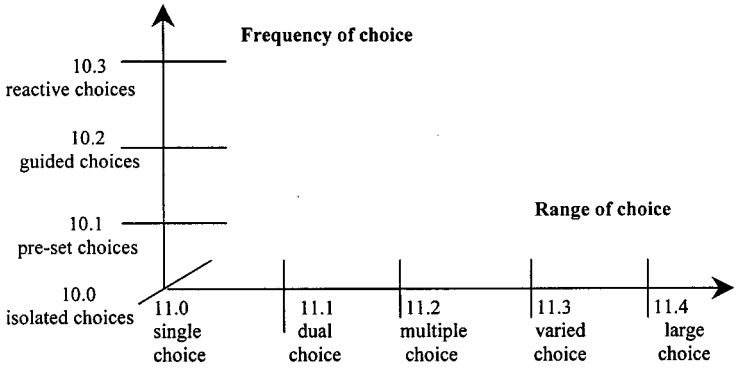


Fig. 3. Frequency and range of choices.

seems to underplay the *Theoriser* learning style. This calls into question the flexibility of the system to efficiently cater for the spread of learning styles in a heterogeneous educational environment. Its limits concerning user-driven scenation (Types 7.3, 7.4, 7.5) and manipulation of data (Types 8.3, 8.4) may well hamper learners (*viz. Theorisers*/Type 3.3)[4] whose curiosity leads them to question what exists and explore alternative modes of learning the language.

12 Conclusion

Our experience at the *University de Valenciennes* has shown that this analysis of CALL can encourage not only the learning process but can also foreshadow future innovations and stimulate critical reflection about learning content and the way users wish to learn a language. In particular, more research needs to be done concerning the link between different types of interactivity, on the one hand, and interaction, on the other hand, that leads to significant learning. For example, low interactivity (e.g. a video clip) can provoke high interaction (e.g. group discussions), just as high interactivity (e.g. computer-generated adaptive activities) can result in low interaction. That said, the reverse can also be true! Closer examination may necessitate tackling issues such as: To what degree do learners with limited confidence in CALL and/or in their language learning skills need more explicit guidance than others (e.g. *frequency of choice*, Type 10.1)? How does one go about identifying these various 'types' of learners? Is it done by the machine (*generative date*, Type 8.3) or by learners themselves (*generative date*, Type 8.4) through self-evaluating questionnaires?

[4]A study of 260 adult learners of EFL (September 2000–February 2001) was conducted at the Université de Valenciennes based on Mumford & Honey's *Learning Styles Questionnaire* to establish reported dominant learning styles. Each learner thus had a four faceted profile, exclusive of each other, based on each of Mumford & Honey's *Learning Styles Questionnaire*. To do this, a 5-point (No opinion; No/Never; Rarely; Often; Yes/Always), close-ended questionnaire of 20 questions was filled in by learners in continuing education. The results show that: 70.1% of learners see themselves as being *Reflectives* (Type 3.1); 67,2% of learners see themselves as being *Theorisers* (Type 3.3); 65.2% of learners see themselves as being *Pragmatists* (Type 3.2); and 55.9% of learners see themselves as being *Activists* (type 3.4).

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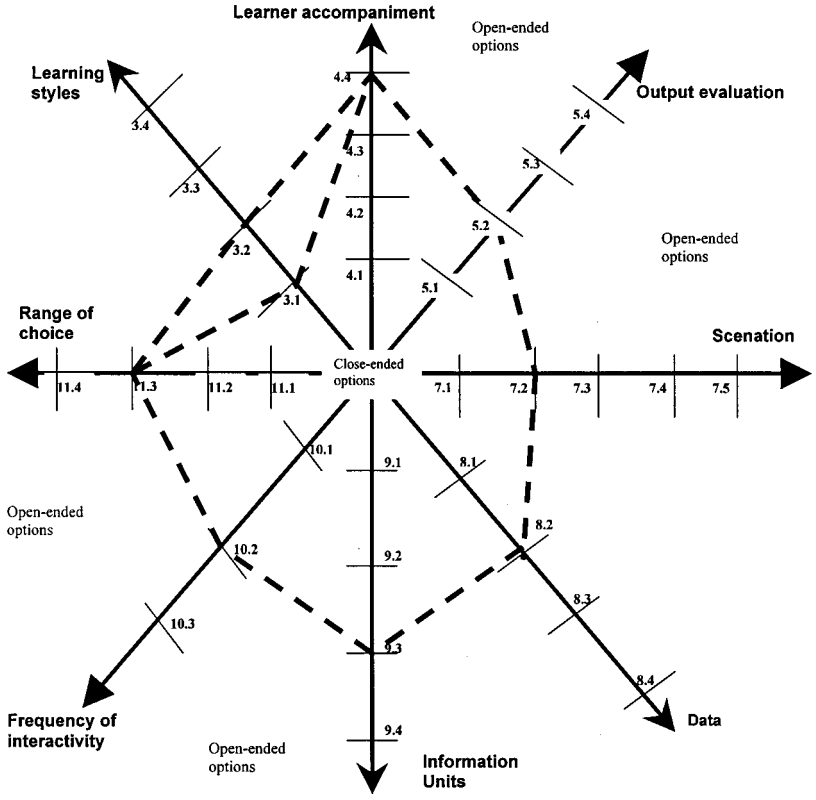


Fig. 4. Authoring tool LEM-speaker evaluated on a graph of interactivity/interaction.

What guidelines could CALL research offer materials designers about these issues?

Our classification represents a way of guiding CALL design and research, and is not meant to be taken as a checklist for designing courseware. It is hoped rather that the classifications presented in this paper can provide a basis for further study in this field. Any such study would benefit by adopting an interdisciplinary approach so that research into CALL could broaden its scope in examining the effects of the various forms of interactivity and interaction for different types of language learners vis-à-vis the linguistic and cognitive particularities of given language (learning) tasks. Such an approach would be greatly aided by a joint effort of learners, pedagogues, materials designers and researchers to exchange views with each other in order to come up with alternative questions and solutions to making CALL more effective both for learners and teachers.

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