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E-learning pedagogy in the third millennium: the need for combining social and cognitive constructivist approaches

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Abstract

An analysis of the characteristics of education and educational institutions of the third millennium shows that predominant features are flexibility, inclusiveness, collaboration, authenticity, relevance and extended institutional boundaries. Roles of both students and teachers have changed significantly as educational goals have broadened to include lifelong learning, global interaction, the acquisition of meta-cognitive knowledge and skills, and processes include negotiated curricula and real-life tutors and informants. This is a demanding package that appears to lead us naturally to a social constructivist paradigm for learning and teaching. While few would dispute the value of this approach in humanistic terms, a series of dilemmas – social, conceptual, political, pedagogical – have been articulated. The author will demonstrate that although these are not insurmountable, addressing them has major time implications. The paper argues that to free up time we need to combine social constructivist activities with cognitive constructivist ones, incorporating personalised ICALL systems.

1 Introduction

Over the past decade a lot has been written about constructivist approaches in teaching and learning, especially in online environments. Generally the approach is seen as synonymous with collaborative, process-oriented learning, and often no other definition or description is given. Vygotsky features most prominently as having influenced this 'new' method with much emphasis given to his 'zone of proximal development'. If we look at the history of educational methodologies, however, it becomes clear that each progressive method – Parker in the late 1800s; Parkhurst in 1919; Dewey, Leont'ev and Luria in the 1930s, Piaget and Gagné in the 1970s – contains similar procedures and philosophies as constructivism – von Glaserfeld, Jonassen, Saxe and Cobb in the 1990s (see also Windshitl, 2002). It has also been suggested that the origin of constructivism dates back to the pre-Socratic Parmenides in the 5th century BC (Candy, 1991), and Phillips (1995) points out that strong epistemological similarities can be found in philosophy (Kant, 1959) and feminism (Alcoff & Potter, 1993).

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It is important to point out that the plethora of learning theories is so varied, and in some cases overlapping, that it would be naïve to suggest a black and white divide into strictly opposing schools of thought, i.e constructivist versus instructivist (Duffy & Cunningham, 1996; Goodyear, 2002). Furthermore, constructivism itself contains several different conceptual and philosophical paradigms, with the two major schools of thought representing *cognitive constructivism* on the one hand, and *social constructivism* on the other. Perhaps the most significant, yet still fairly simplistic difference between exponents of cognitive and social constructivist approaches is that the former focus on the individual in the group, believing that cognition occurs in the head of the individual and that learners make intellectual sense of the materials on their own, whereas the latter emphasize the socially and culturally situated context of cognition, in which knowledge is constructed in shared endeavours (Duffy & Cunningham, 1996). Some educationists also refer to the former perspective as 'constructivist' (associated largely with Piaget) and the latter as 'socio-cultural' (associated predominantly with Vygotsky).

Recently there has been a trend towards a synthesis of the two, with advocates believing that knowledge is constructed individually but mediated socially (see Windschitl, 2002). Interestingly, both Vygotsky and Piaget have expressed views that support this notion from almost opposing perspectives:

> …any higher mental function was external and social before it was internal. It was once a social relationship between two people…We can formulate the general genetic law of cultural development in the following way. Any function appears twice or on two planes…It appears first between people as an intermental category, and then within the child as an intramental category. (Vygotsky, quoted in Cobb, 1994:16)

> In the realm of knowledge, it seems obvious that individual operations of the intelligence and operations making for the exchanges in cognitive co-operation are one and the same thing, the "general coordination of actions" to which we have continually referred being an interindividual as well as an intraindividual coordination because such "actions" can be collective as well as executed by individuals. (Piaget, 1971:360)

This synthesised view is most relevant in the context of our paper. Our purpose is to examine the characteristics of contemporary education; take a closer look at the dilemmas associated with social constructivism, especially as it relates to online language learning, and provide some practical solutions for addressing these.

2 Characteristics of contemporary education

Education has changed tremendously over the past few decades, not least as a result of easier access to networked information and communication technologies. Common adjectives attributed to both education and educational institutions are: *flexible, inclusive, collaborative, authentic, relevant, global* and *effective*. The shift from second to third millennium thinking, given in Table 1, albeit simplistically and ambitiously put,

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Table 1 *(From Townsend, Clarke & Ainscow, 1999: 363)*

Second Millennium Thinking	Third Millennium Thinking
Important learning can only occur in formal learning facilities.	People can learn things from many sources.
Everyone must learn a common 'core' of content	Everyone must understand the learning process and have basic learning skills.
The learning process is controlled by the teacher.What is to be taught, when it should be taughtand how it should be taught should all be determined by a professional person.	The learning process is controlled by the learner. What is to be taught, when it should be taught and how it should be taught will all be determined by the learner.
Education and learning are individual activities.	Success is based on how well learners learn as individuals.
Education and learning are highly interactive activities.	Success is based on how well learners work together as a team.
Formal education prepares people for life.	Formal education is the basis for lifelong learning.
The terms 'education' and 'school' mean almost the same thing.	'School' is only one of a multitude of steps in the education journey.
Once you leave formal education, you enter the 'real world'.	Formal education provides a range of interactions between learners and the world of business, commerce and politics.
The more formal qualifications you have the more successful you will be.	The more capability and adaptability you have the more successful you will be.

signals a noticeable move from instructivist to constructivist pedagogy.

Exponents of third millennium thinking, as articulated above, clearly believe in pedagogies that foster *the acquisition of meta-skills and knowledge; relevant/negotiated curricula, collaboration; lifelong learning; global learning and access to real-life tutors and informants*. It is not surprising, therefore, that social constructivism has gained momentum as the obvious pedagogical paradigm.

3 Social constructivism

Interest in [social] constructivism in relation to computer-assisted learning became prominent in the 1990s, largely associated with Jonassen (1991, 1996) and Duffy and Jonassen (1992). While interest was focussed predominantly on science and mathematics education, its relevance in the area of language learning, and more specifically CALL, did not go unnoticed (Wolff, 1994; Rüschoff, 2001).

> Constructivists go further than pure cognitive approaches by recommending "that we help [learners] to construct meaningful and conceptually functional representations of the external world". (Jonassen 1991:29) They view learning as an

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> active, creative and socially interactive process and view knowledge as something children must construct and less like something that can be transferred. (e.g. Florin 1990) The difference can be further explained by quoting Jonassen who discusses the outcome of mental activities in predominantly objectivist learning as externally mediated reality rather than the internally mediated reality in constructivist learning. (cf Jonassen 1991:28) Learning based on constructivist principles will allow learners to tap into resources and acquire knowledge rather than force them to function as recipients of instruction. Such approaches are meeting with growing approval and are regarded by many educational thinkers as a suitable framework for the learning environment of the future.
> […]
> Apart from simply rejecting a traditional instructivist paradigm the constructivist paradigm is seen as an important methodological basis for a real innovation in foreign language learning. And the development of communicative competence is supported by language awareness and learning competence. (Rüschoff, 2001:4)

Few would dispute the value of constructivist approaches in humanistic terms. After all, addressing needs and interests of students; engaging them in authentic, real-life tasks; allowing them ownership of the curriculum, to name only the most significant elements, constitutes sound pedagogical values. However, both enthusiasts and critics (Mason, 1993; Levy, 1997; Felix, 1999, 2002; Bain, 2003; and especially Windshitl, 2002) have articulated dilemmas that cannot be ignored. We will address the most relevant ones below.

3.1 Dilemmas

Social

> At the root of the problem of co-operation is the fact that there is often a tension between individual and collective rationality. That is to say that in many situations, behaviour that is reasonable and justifiable for the individual leads to a poorer outcome for all. (Kollock & Smith, 1996:109)

This is reminiscent of Bandura's view that 'inveterate self-doubters are not easily forged into a collectively efficacious force' and that 'perceived collective efficacy will influence what people choose to do as a group, how much effort they put into it, and their staying power when group efforts fail to produce results' (Bandura, 1986:449). These sorts of problems are often cited in discussions of collaborative ventures (Felix, 1999; Levy, 1997), and overcoming them requires careful attention to group dynamics and unobtrusive monitoring of group activities on the part of the teacher. Goodyear (2002:70) further cites Kollock who draws on research which has studied whole communities acting together. Communities that have been successful in managing collective resources and social dilemmas have had the following features:

1. A clearly defined group boundary, to help identify who is making use of group resources.
2. Local customization of norms and rules about the use of group resources

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(enabling people in the group who were knowledgeable and committed to have a say in shaping the group's rules).

3. A system for monitoring and sanctioning members' behaviour (without recourse to an external authority).
4. Access to low cost conflict-resolution mechanisms.

While tutor facilitation of online language learning may not require management systems of such proportions, it is obvious that much more time is required to organise and sustain successful collaborative project work than in traditional classroom settings, even without the additional attention that needs to be given to potential conflict resolution.

Conceptual

The following points articulated by Windschitl (2002) are highly reminiscent of dilemmas associated with communicative teaching in the 1970s and 1980s.

- misunderstanding the concept:
  – disconnections between theory and practice
- 'naïve constructivism':
  – placing faith in learners' ability to structure their own learning and simply equating activity with learning
- 'superficial imitations' of constructivism:
  – engaging students in 'safe simulations' or co-operative learning carried out in overly controlled situations
- believing that direct instruction has no place at all.

What is obviously required for teachers if they are to facilitate successful constructivist learning is the ability to change the culture, climate and dynamics of the classroom or the online environment. For this to happen they need to have fully understood and internalized the conceptual philosophy of the approach and the processes that will produce the best outcomes. Often, though, teachers do not have the time to study in great detail a method they may feel they have understood superficially, and even more importantly they can be hampered by their own learning experiences, largely informed by instructivist epistemology. Thus, just as in communicative teaching, the implementation of constructivist methods is often patchy rather than holistic:

> …it is possible to change "on the surface" by endorsing certain goals, using specific materials, even imitating the behavior without specifically understanding the principles and rationale for change. Moreover…it is possible to value and even articulate about the goals of change without understanding the implications for practice. (Fullan & Stiegelbauer, 1991:40)

Political

Windschitl (2002) also talks of political pressures on teachers which seriously compromise their ability to function as social constructivist facilitators.

- Different expectations of students/peers/administrators/parents/authorities.

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- The need to adhere to 'standards'.

These are very serious problems, especially for inexperienced teachers to deal with. Windschtitl (2002) cites numerous examples in which constructivist approaches were abandoned because of pressures from parents and administrators, who did not see this sort of learning as leading to serious outcomes. This author has herself had ample experience with students regarding her approach as frivolous and lazy ("aren't you going to do anything?"). However, these observations have always abated as the course progressed and students became more familiar with the underlying philosophy. It takes courage to let go and transfer responsibility for the learning to the students, and the approach can only be sustained against initial resistance if teachers themselves are utterly convinced of its value.

The problem of having to adhere to imposed standards, which is becoming more and more common in educational systems around the world, is closely related to the question of linguistic accuracy, discussed below, and equally difficult to overcome in constructivist settings. However, Winschitl and others point out that:

> …this kind of project-based learning must be skillfully orchestrated so that, however students choose to identify and investigate problems, they will acquire an understanding of key principles and concepts as well as the thinking skills that are assessed on high-stakes tests. Indeed, proponents of project-based learning have demonstrated that these kinds of learning outcomes are entirely possible (Blumenfeld et al, 1991; Muncey, Payne & White, 1999). (Winschitl, 2002:44)

Pedagogical

Learner versus instructor control

The need for creating a balance between learner control and instructor control in online learning has been the subject of much discussion. The concept of Moore's (1983) *transactional distance* is relevant here. This key concept in distance education theory is defined as a function of two variables, *dialogue* and *structure*, in which 'distance in education is not determined by geographic proximity, but rather by the level and rate of dialogue and structure' (Saba & Shearer, 1994). In an interesting empirical study, using a form of desk-top video-conferencing, the latter authors set out to verify this concept and found the following:

> An increase in the level of learner control increased the rate of dialogue, which in turn decreased the level of transactional distance; an increase in the level of instructor control increased the rate of structure, which in turn increased the level of transactional distance (Saba & Shearer, 1994:54).

Naturally, there cannot be any hard and fast rules that will apply to all students equally. While some students prefer working unguided and in groups, others need more structure and frequent reinforcement from the teacher. A neat idea for reducing uncertainty about individual involvement in project work has been suggested by Murphy, Mahoney and Harvell (2000) who designed explicit contracts for instructor and student responsibilities.

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Table 2 (*From Felix, 2003:159)*

Personal journals (on/off line – formative) • for process oriented reflective purposes and self-assessment
Peer assessment (online – formative+summative – may include expert) • in discussion groups, BBS (with sound), MOOs, Chats, Blogs • judging of short answer questions • judging of contributions to larger topic, interactive stories
Portfolios (on/off line - formative+summative – marked by tutor) • dynamically evolving measure • includes outcomes of various tasks, processes, interactions negotiated between tutor and students
Products (online – summative – marked by tutor/peer/expert) • tangible outcomes of co-operative or sole project • Websites produced on specific topics

The variable of scepticism has also been found to be influencing student participation online, for example if students strongly believe that they will not forge any relationships online, they will not (Utz, 2000). Another important element in group dynamics is students' self-concept about their abilities: 'Among the types of thoughts that affect action, none is more central or pervasive than people's judgements of their capabilities to deal effectively with different realities' (Bandura, 1986:21). The teacher's role in communicating positive expectations is no less important online than it is in a classroom. This can often be handled in private communications between teacher and student, away from the core business of the project work. It is also an important part of dealing with the assessment of co-operative projects.

Authentic assessment

If we believe in *testing what we teach* it becomes obvious that current online automated testing devices, designed to teach objective knowledge, are largely unsuited for the purpose of testing what the students have learnt in the processes that accompany social constructivist approaches. While there is a place for such forms of testing in formative assessment along the way, fostering a reflective process on the more formal structures of the language that has been acquired, the majority of assessment procedures need to focus on both the process and the outcome.

The most distinct feature of authentic testing is not that the emphasis is simply on testing knowledge summatively but that the assessment process itself is seen as a continuation of the learning process and naturally accompanies the learning program in a variety of ways (Table 2 lists some strategies typically used in authentic assessment). This is a great challenge and the extra time needed for implementing sound authentic assessment, therefore, is obviously substantial.

Linguistic accuracy

Social constructivist approaches hardly lend themselves to the achievement of linguistic accuracy – constant corrections of grammar or pronunciation would not only seriously

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interrupt communication and fluency but also compromise the positive aspects of authenticity and anonymity afforded in some of these ventures (Felix, 2004). While we have seen mature-aged distance students complain about the absence of a focus on form in an online collaborative project (Shield & Hassan, 2003), this author is inclined to agree with Shneiderman (1998), who believes that the majority of students prefer to *create, communicate, build, explore, discover* and *collaborate* than engage in drill and practice, acquiring facts or accessing information. The challenge, therefore, is to provide pedagogically sound means for learners to engage in activities that will improve linguistic accuracy. How this might be approached is discussed in more detail at the end of the paper.

3.2 Time constraints

While it is not suggested here that the challenges discussed above are insurmountable, what has become abundantly clear to anyone involved in social constructivist ventures is the fact that addressing them has major time implications. If we are concerned about achieving the best results for our students, we must be prepared to invest serious time in monitoring group dynamics, devising sound assessment procedures that match the processes of learning in which students are engaged, and finding ways of raising linguistic accuracy without compromising a learning climate that emphasises risk-taking while allowing students to make errors in a safe environment. A tall order indeed, especially in view of the impossibility of conjuring up many extra hours in our working day.

However, why not revisit what the computer can do for us in automated terms? Through many years of battling with time constraints, this author feels strongly about combining social and cognitive constructivist approaches in online learning (a view also suggested by Allen, 1992), because the latter will free up considerable time to engage more fully in the former. Naturally this claim only holds if we do not have to carry out all of the developments ourselves but can integrate already existing resources.

4 Cognitive constructivism

Whereas social constructivists see learning as increasing the student's ability to participate with others in meaningful activity, cognitive constructivists focus on how individuals create sophisticated mental representations and problem-solving abilities by using tools, information resources and input from other individuals (Wilson, 1996). In a technology-enhanced environment, one major distinction between social and cognitive constructivism approaches is the focus on interaction with people and co-construction of knowledge in the former, and interaction with content and individual construction of knowledge in the latter, although this should not be seen as exclusively the case in either. It is also important to point out that cognitive constructivism is not synonymous with *cognitive processing* which was the dominant theory informing instructional design in the 1970s.

> Cognitive processing theorists share, if not the same epistemological bed, at least the same house with behaviorists. The true 'opposite' to the objectivist epistemology of cognitive processing is constructivism. (Heylighen, 1997, in Miller & Miller, 1999:109)

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This is important for the final part of our discussion. There are numerous resources available on CD-ROM or on the Web that will engage students in many hours of work for listening and reading comprehension, and the acquisition of vocabulary and cultural knowledge (see Felix, 2001). However, these resources tend to consist predominantly of traditional drill-and-practice paradigms with poor feedback structures. If we are serious about the value of engaging students in meaningful, contextualised activities, it would seem unnatural to disrupt the overall climate and dynamics of the enterprise by sending students off to a computer lab to engage with impersonal, decontextualized materials (see also Leung, 2003). The last part of this paper will therefore look at how automated activities for language learning are currently enriched and humanized in various creative ways in a form of instructional design that has come to be known as Intelligent CALL (ICALL). In this context Confrey's (1990:109) view of constructivism is perhaps most relevant:

> When one applies constructivism to the issue of teaching, one must reject the assumption that one can simply pass on information to a set of learners and expect that understanding will result. […] When teaching concepts, as a form of communication, the teacher must form an adequate model of the student's ways of viewing an idea and s/he then must assist the student in restructuring those views to be more adequate from the student's and from the teacher's perspective. Constructivism not only emphasizes the essential role of the constructive process, it also allows one to emphasize that we are at least partially able to be aware of those constructions and then to modify them through our conscious reflection on that constructive process.

5 Intelligent CALL (ICALL)

The emerging focus on constructivist approaches towards the end of the last millennium brought with it an about turn in the provision of feedback in automated learning activities that directly corresponds to Confrey's view above. Robinson (1991:165-166), who examined CALL feedback from the perspective of perception theory and social learning theory, combined with her own findings in an extensive research study, concluded the following:

1. *People learn best through their own experiences*. CALL feedback which guides learners to discover correct and incorrect responses themselves (i.e., internal detection of errors and provision of answers) is more effective than program disclosure of answers and incorrect responses (i.e., external provision).
2. *"You're wrong" is generally more often remembered than "You're right*." Through the CALL medium, learners are confronted with their own errors. To counter the potential negative effect that may result (i.e., the exaggeration of visual and auditory error messages and subsequent negative self-concept that could result, CALL designers must explicitly emphasize positive aspects of communicative attempts and implicitly guide learners to notice and correct their own errors.
3. *In charge or in control?* Being prematurely in charge can mean being out of control. CALL programs which selectively combine elements of student control with

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elements of programmed help will gradually lead to the development of internal learner control and mastery.

4. *Once is not enough!* Language learners also need multiple opportunities to practise similar material in order to develop learner control and achieve mastery. CALL programs which recycle items through the introduction of parallel items provide such opportunities for mastery.

While intelligent CALL is still in its infancy as far as artificial intelligence capabilities are concerned, especially in relation to speech technology applications (see Gamper & Knapp, 2002), automated systems have come a long way in addressing the points made above. For obvious reasons ICALL systems focus predominantly on the acquisition of vocabulary and grammar and on improving pronunciation. Increasingly, however, we encounter new developments that allow for free language input, sophisticated translation systems (see below), and even individualized video-based programs, designed to enhance communicative skills (Hada, Ogata & Yano, 2002). Discussing all these in detail is beyond the scope of this paper, and we refer the reader to the comprehensive overview in the special issue of the *CALL* Journal on ICALL edited by Tokuda (2002).

The point of interest for our discussion is that there is much emphasis now on designing activities that engage learners in metacognitive processes (see also Collentine, 2000) and on providing human-computer interactions which reflect more closely natural human interaction. In the following we will take a brief look at the sorts of ways in which feedback is becoming increasingly personalized, using sophisticated parser systems that generate hints, tailored to individual responses and integrating strategic graphics.

6 Personalized feedback

6.1 Hints

The hint can take the form of an explanation of the point at issue, the object being to help the student engage in metacognitive reflection on the problem and use that understanding to produce a correct repeated response. This sort of feedback is going to be possible or, at least, highly accurate only for foreseen errors, though collecting student responses should allow for a rich database of likely errors to be built up over time (see Wible *et al*, 2003). Two excellent examples of this type of hint have been developed by Heift (2001, 2002) in the context of teaching grammar, and by Pujolà (2001) to help with reading and listening comprehension. Heift's feedback is generated by an Intelligent Language Tutoring System (ILTS). The parser-based system analyses student input and provides error specific feedback, exclusively in the target language, and includes a facility that matches feedback messages to learner expertise and provides remedial exercises (Heift, 2001:99). The underlying pedagogy of the program reflects Garrett's (1987) discussion of the use of Natural Language Processing (NLP) for providing sophisticated feedback in which the individual explanation of errors mirrors more closely what might take place in a face-to-face setting. An interesting aspect of Pujolà's program is that it also provides a delayed two-step option that allows users to reflect on

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the reason for an error before accessing the explanation. Both authors have run evaluations on their systems which showed that the majority of learners do in fact make use of these hint facilities. Furthermore, Heift cites a number of studies that have found positive effects of metalinguistic feedback over traditional forms (Nagata, 1995, 1996; Nagata & Swisher, 1995). She also points to research by Van der Linden (1993) which showed that lengthy feedback messages are not being attended to and that feedback dealing with multiple errors was found to be too complex. Virvou, Maras and Tsiriga (2000:13), who developed a similar program to Heift's for teaching the passive voice of English grammar, found that the 'Passive Voice Tutor was successful in achieving a high degree of compatibility with the human experts' opinion'.

Using a similar ICALL system, Chen and Tokuda (2003), Chen, Tokuda and Xiao (2002) and Tokuda and Chen (2001) have developed a sophisticated program for online translation training based on template pattern matching. The templates use words or phrases as a minimal unit, with the databases selected by experienced language teachers in the light of responses collected from sample students. The program includes a heaviest common sequence algorithm for matches aimed at identifying, from among a large number of possible paths embedded within the template, the path with the greatest similarity to the learners' input translation. What the program delivers is error contingent feedback for each student input.

A different but very interesting approach for engaging students in metalinguistic reflection, explicitly designed around cognitive constructivist principles, is described by Collentine (2000). This multimodal software, consisting of video and audio files also contains innovative 'comprehension-check' and 'exemplar contemplation' components. By means of user-behaviour tracking the author determined that the latter was most useful (more than video and audio) in achieving the production of indirect speech in Spanish.

6.2 Graphics

Although research in this area is scarce, there is some evidence of positive effects of graphics used in teaching, especially in science subjects (Hedberg & Alexander, 1994; Kaufmann, Schmalstieg & Wagner, 2000; Moore, 1995; Dalgarno & Hedberg, 2001). Visual interface in general is seen as a fundamentally important element in online design (McGreal, 1997; Jung, 2001). Many different ways of integrating graphics into the learning resource are being used, ranging from simple stick figures to sophisticated simulations using virtual reality applications. Multisensory input has long been held to benefit learning for two reasons. On the one hand different areas of the brain are stimulated simultaneously, on the other different learning styles (visual, auditory, symbolic) can be catered for (Dede 1996).

Very few studies have investigated the role of graphics specifically in language learning. Hew and Ohki (2001) found that Animated Graphical Annotation – a set of animated graphics representing visually the accent of Japanese words – was effective in improving students' listening skills. In our own studies we found a significant relationship between students' rating highly the usefulness of graphics (in this case simple stick figures) and working longer hours online (Felix, 2000). Amusingly, a participant at one of the author's presentations raised the question whether this could not simply have

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been the result of long download times! While this was not the case here, it is an important consideration in designing graphics. At no time should a desire for sophistication and look outweigh the pedagogical value of the item itself, especially not when functionality might be compromised.

Tokuda and Chen (2001) developed a part of speech tag parser which provides a visualised parsed tree of acceptable accuracy. This operates by applying the parser to the closest model translation to obtain the best matched path to the student input translation, and identifying all deviations from the correctly parsed trees as errors. The parser not only provides a visualized tree demonstrating where students' errors are located, but also acts as the base for setting up an efficient learner model showing how these errors can best be repaired (Chen *et al*., 2002).

Accompanying characters acting as a tutor-companion feedback device have the potential to change the entire dynamics and climate of an online course. Pinocchio in *Cyberitalian*, Lina and Leo in the popular Goethe German course for beginners and the witch Hexe Hilde in our own intermediate German course *Hildes Hexenwelt* add a personal dimension to interacting with a program that can add interest and curiosity and communicate humour and enthusiasm. It also helps in the creation of a larger and more varied repertoire of automated responses. Hexe Hilde, who is young and quirky has her own special vocabulary which represents how German teenagers communicate these days. She can also swing a magic wand in approval or sweep away an incorrect response with her broom, appear as a contestant in a game show, and be the one to whom assignments are being sent. A word of caution: overly enthusiastic, gratuitous use of these, especially in animated versions, can become as irritating as sound effects; we only need to remember Microsoft's experience with *Clippy*, the animated Help sprite in Office 2000, which became so hated that it was abolished from Office XP.

7 Conclusion

If we take seriously third Millennium thinking in which emphasis is placed on students acquiring meta-skills and knowledge, shaping relevant, negotiated curricula, being involved in collaborative, lifelong, global learning with the help of real-life tutors and informants, a social constructivist approach presents itself as the natural pedagogical paradigm. We need to be careful, though, to address serious time constraints that can arise in relation to social, conceptual, political and – most of all – pedagogical dilemmas. If we want to achieve high levels of fluency and accuracy in language learning, we might consider incorporating cognitive constructivist activities in the shape of ICALL systems. Although quite different, the two schools of thought complement each other well in an online environment, especially if we take care to humanize and personalize automated activities as much as possible within current technological limitations. Such an approach would uniquely exploit the full capacity of both static and dynamic technologies. It would on the one hand expose learners to sophisticated automated activities, engaging them in autonomous, predominantly cognitive and metacognitive processes; on the other, with the help of networked systems, it would involve them in collaborative, process-oriented real-life activities fostering psycho-social processes. It is hoped that this would lead to a redistribution of scarce tutor time and better linguistic accuracy. To test these bold assertions will make a rich topic for further research.

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