THE ROLE OF THE HUMAN TEACHER IN LEARNING ENVIRONMENTS OF THE FUTURE

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1. Introduction

Aside from its actual efficacy in promoting learning, one of the most useful contributions of educational technology is the extent to which it provokes us to re- examine some of our long-held assumptions in relation to pedagogical principles and practices. Those of us who teach are sometimes a little complacent about the 'value' we add to the learning experiences that take place within formally constituted educational environments. We are apt to forget that a great deal of our students' learning takes place without our intervention, or sometimes even despite it! What special contribution does the human teacher make to learning, and to what extent might it be replicated or even surpassed by current or future examples of agent technology within learning environments that are wholly or partly electronically based?

2. Learning Environments of the Future

Extrapolating from current trends in pedagogical thinking, a number of assumptions can be made, albeit tentatively, about the characteristics we might expect to find in learning environments of the reasonably near future. As a consequence of the potential of electronic environments for both communication and information access, it seems extremely likely that a significant proportion of the educational experiences of learners will be based on the

Internet or its equivalent.

Within both face to face and electronic learning environments, growing recognition of the importance of the social dimensions of learning has brought with it a blurring of the distinction between teachers and learners, with the traditional classroom increasingly being reconceptualised as a 'community' of learners. This emphasis on collaborative learning is reinforced by the strong trend in the majority of workplaces towards working in groups or teams. Employers are concerned that their future employees possess the special skills needed to support such work practices. It is therefore reasonable to anticipate that collaborative and co- operative work will be a feature of the classroom of the future, whether face-to-face or electronically mediated.

Alongside current emphases on the social aspects of learning is a widespread acceptance of the Vygotskian notion of 'scaffolding'(Berk & Winsler 1995), and a desire on the part of many educators to provide learning experiences characterised as 'authentic'. While this latter term has undergone a number of different manifestations in recent years (Brown 1989, Oliver 1999), common features include a rejection of abstract, decontextualised learning experiences in favour of learning that is situated in contexts reflecting the rich complexity of real world experience. A good example is the new focus on problem based or case based learning in medical and nursing education. At the elementary or secondary school level, an Internet search quickly reveals a proliferation of examples in every subject area, many of these depending heavily on technology for their realisation. It seems likely that these ideas are sufficiently well established that they will retain their relevance in the classroom of the future.

3. What Human Teachers Can Do

Human teachers characteristically perform a wide range of activities that we subsume under the general heading of 'teaching'. These include planning and designing, demonstrating, guiding, telling, questioning, testing, recording, motivating, criticising— even learning. Many of these aspects of a teacher's role require significant expertise and the making of finely tuned and sensitive judgments based on both breadth and depth of experience. This is important, for instance, in relation to the provision of appropriate scaffolding to learners. It can also be argued that the human teacher is in a strong position, in particular by virtue of overall life experience and sophistication as a communicator, to both model and facilitate co-operative learning behaviours. And who better than a 'real' teacher to recognise and develop
'authentic' contexts for learning?

4. What Pedagogical Agents Can Do

It is becoming increasingly common for designers of computer supported learning environments to assign various aspects of the teacher's role to software agents—computer programs possessing varying capabilities including differing degrees of autonomy, and in some cases significant personification or characterisation. Many of them are capable of a complex range of interactions with the student, with one another, and increasingly with agents associated with other programs. Their individual purposes derive from theoretical analyses of the component tasks and activities, such as those listed above, that contribute

to the role of the human teacher. As Johnson writes:

"Pedagogical agents are autonomous agents that support human learning, by interacting with students in the context of interactive learning environments. They extend and improve upon previous work on intelligent tutoring systems in a number of ways. They adapt their behaviour to the dynamic state of the learning environment, taking advantage of learning opportunities as they arise. They can support collaborative learning as well as individualized learning, because multiple students and agents can interact in a shared environment. Given a suitably rich user interface, pedagogical agents are capable of a wide spectrum of instructionally effective interactions with students, including multimodal dialog. Animated pedagogical agents can promote student motivation and engagement, and engender affective as well as cognitive responses." (Johnson 1998: 13) Is this vision too good to be true?

While it may be difficult for us to accept that such roles can be effectively enacted by a computer program, developers and researchers are quite clearly attempting to align their use of pedagogical agents with current directions in educational theory. Examples include the work of Sheremetov and Nunez (1999: 306) who write:

The design of learning environments, virtual or not, aims to promote productive interactions. In this type of learning a student changes from being a passive information receiver to an active collaborator, interacting with the tutors and colleagues in the learning process. Learning does not only result from acquiring knowledge, solving problems or using tools, but also from interacting about these on-going activities with persons and agents.

One type of agent described by these researchers fulfils a meta-role within the learning community. It is able to modify the role, behaviour or expertise of other agents characterised as 'fellow learners,' for instance from that of a strong group leader to a weaker companion or even a passive observer, depending on its interpretation of whether the learner requires more or less guidance. Again, as Solomos and Avouris (1999: 259) suggest:

The user mental model of the system should be based on the metaphor of the 'invited professor' rather than the 'knowing everything own tutor.' Our first findings confirm the observation that today's users, accustomed to hypertext-like interaction, are more likely to accept this collaborative teaching metaphor….

Attempts are even being made to replicate emotional behaviour and responses in software agents (Frasson 2000).

5. Some suggestions for role differentiation

It has been suggested, however, by theorists such as Pufall (1988) that even the most heavily personified of computer programs suffer from an intrinsic lack of ability to participate in the metacognitive aspects of learning. While this is largely a matter of definition and may be disputed on several grounds, it does suggest that going through the outward motions of 'teaching' may not be the whole story. Perhaps most worthy of

discussion in this regard is the assumption that a reductionist analysis of the component parts of the holistic activity of teaching with a view to reproducing it through the actions of multiple agents adequately reflects the contribution of the human teacher to students' learning. Could it be that the human act of teaching is more than the sum of its parts?

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