Sign Language Learning through Asynchronous Computer-Mediated Communication (CMC)

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Abstract

Current research shows that CMC provides an excellent vehicle for L2 learning since it affords both teachers and learners to communicate in an authentic learning environment where negotiation of meaning in the target language can take place in the same way as in face-to-face interaction. As bandwidth networks become more developed, it is feasible to transmit sign language communication using digitised video. In this paper, I present SignLab, a virtual sign laboratory at the Centre for Deaf Studies (CDS), in Bristol University, U.K., developed through the use of 'Panda' software. It is an asynchronous videoconferencing system developed for the learning of British Sign Language. In this paper, I discuss how SignLab changes the concept of traditional sign language teaching and learning in terms of course delivery, tutors' and students' online roles, course material and online communication and collaboration. At the end, I propose a framework based on constructivist and learner-centred principles that teachers may consider applying when teaching online.

1.   INTRODUCTION

Traditionally, sign language teaching and learning is heavily depended on visual simulations (e.g., animation, text-books and video) for one and main reason: sign language is visual language and learners, in order to learn it, need to view its motion and its all inhibited non-manual characteristics. Many programmes use text-based material, CD/DVD multimedia and analog or/and digital video for the instruction of sign language. Text-based material (e.g., textbooks and dictionaries) is not enough for the studying of sign language as they consist of pictures and drawings, which cannot express the full emotion and its four-dimensional form that is the feature of sign language (Fourie, 2000; Sagawa & Teaceuchi, 2002). Learners need to be shown how to execute a sign and how certain modulations affect the meaning of signs. However, these modulations are not presented in published books and thus, learners are rarely able to convey grammar and/or semantics (Hoemann, 1978).

Videotapes, CD/DVD-ROMs and animated material solve this problem by incorporating video or/and animating images of sign language. Animated signing characters (e.g., signing avatars) of 2D or/and 3D designs can represent sign language but they require advanced skills in graphic design. The easiest solution to these problems is the integration of digital video into sign language classrooms (Cormier & Carss, 2004). Digitised video is now broadly used in videoconferencing systems, which enable second language (L2) learning to take place online.

In this paper, I introduce SignLab, an online virtual classroom which functions through the use of Panda software exclusively designed at the Centre for Deaf Studies, in University of Bristol, U.K. By presenting its facilitating features during the teaching and learning of British Sign Language (BSL), the discussion will focus on

its impact on (a) course delivery, (b) students' and tutors' online roles, (c) course material (e.g., activities and assessment), and (d) online communication and collaboration. From a pedagogical perspective, this papers attempts to present a framework for the virtual learning of sign language, which tutors may consider applying when teaching from distance.

2.   VIDEOCONFERENCING IN VIRTUAL LEARNING

The focus of this paper is on desktop videoconferencing technology. This term is used to describe desktop computers connected into the Internet and, fitted with a web cam and appropriate software, they allows users to communicate visually and in the target language much in the same way as in face-to-face communication (Martin, 2005; Smyth, 2005).

Videoconferencing is widely used in virtual learning and its potential has been recognized by recent research in different educational settings, at local and international level (Martin, 2005; Wang, 2004). It bridges the instructional gap which is created by physical distance between teachers and students since both can meet "face-to-face" visually, in real time or in an asynchronous mode of communication. It transforms the educational experience of people of all ages and it can be integrated into any curriculum and at all stages of education (Martin, 2005).

Actually, videoconferencing is in between face-to-face and text-based contact as far as verbal and non-verbal clues are integrated or not. Paralinguistic cues such as head nods and facial expressions improve understanding, increase confidence and reduce isolation between the users who are physically separated from one another (Wang, 2004). Regarding the video component, it is

pointed out the importance of eye gaze awareness, the ability to monitor the direction of participant's gaze and thus, the focus of attention (Dustdar & Hofstede, 1999).

Research shows that video-based discourse reduces the difficulties of comprehending a L2 because the learner's potential for comprehension is increased if the visual information is included in the presentation (Gruba, 2004). This means that video allows learners to understand more than their linguistic knowledge permits and thus, motivates their learning. Through the display of props, actions and interaction learners "(1) narrow interpretations when they observe physical settings, (2) validate tentative hypotheses when they make sense of action, and (3) judge emotional states when they see interaction" (Gruba, 2004: 52). By using digitised video, users can stop the flow of information over poorly understood areas and concentrate on these in order to achieve better understanding.

The interactivity of online video makes learning more effective since the learner can ask questions directly to the teacher or to his/her colleagues. In addition the teacher can intervene and correct learner's language even with non-verbal information like gestures (Hada et al., 2002). The learning experience is extended by recording the videoconferences and using the videos as resources (Martin, 2005). Both teachers and learners can reuse the conversational videos for editing and reviewing past lessons. In this case, teachers can grasp learners' mistakes that they might missed during videoconferencing and students can memorize questions or feedback that occurred during online conversations (Hada et al., 2002). The video clips can then be posted on the Internet for the use of others (Martin, 2005).

Furthermore, videoconferencing allows online markup - based collaborative correction. By using the original digitised video, teachers and learners can intervene in video sequence and add their comments and corrections. Such correction system has been developed by Hada et al. (2002), which they have called the Video-based Communicative Language Learning System (Viclle).

However, video transmission is still a challenging area. When the bandwidth of the network is limited, data can be lost and this creates problems in the quality of the conversation. The motion of videoconferencing is 'jerky' and nuances in facial expression are lost. Because of perceptual latency problems it is often the case that participants do not understand the language of their interlocutors (Kinginger, 1998). Problems in video quality also disturb "the trajectories of the hands and arms which are essential in recognising sign language" (Ashourian et al., 2005: 1090). Therefore, the bandwidth required for real-time video transmission of sign languages needs to be greater that the bandwidth available on current networks (Saxe & Foulds, 2002). However, videoconferencing located within a Local Area Network (LAN) connection,

such as within a university department, enables higher bandwidth that means higher-speed video transmission (Ryan et al., 2000; Smyth, 2005; Wang, 2004). Moreover, the small video windows on participants' computers screens do not allow full view of users' working environment. Information about who is sitting next to a user or who is not is limited since the camera is positioned on the front of participants' screens and the context cannot be fully viewed (Dustdar & Hofstede, 1999).

This restricted communicative space has resulted in the development of new linguistic and sociolinguistic sign language practices (Muir & Richardson, 2005). It is found that Deaf individuals modify their signing within this new space. For example, some signs usually produced above or at the waist level in the videoconferencing environment are produced with the hands almost at the chin level (Keating & Mirus, 2003).

3. INTRODUCING SignLab

Advances in desktop videoconferencing have enabled its use in sign language learning (Mertzani, 2005). Having a web cam, Internet connection and videoconferencing software, learners and teachers can meet "face-to-face" visually, and send or receive video information from their remote desktop computers. It enables Deaf and hearing to communicate and thus, to build an online sign language classroom, the SignLab. This classroom is based on a Local Area Network (LAN) connection within Centre for Deaf Studies, University of Bristol, U.K. where seven Apple Mac computers are networked and connected to a central 360 GB server.

Panda is the software installed in all computers and with which teachers and students work while being online. It allows very easy recording of video (and audio), which automatically compresses it into MPEG-4 format, a highly compressed format with minimal storage requirements and minimal time spent in waiting for compression and moving files between drives. By using Panda, students and teachers can film themselves signing, save the digitised video files in the server and share their work with each other or with other provisional users (Cormier & Carss, 2004).

In particular, SignLab comprises an asynchronous videoconferencing system since teachers and students are not online simultaneously, in real time but and there is a delay of hours or days between messages and their replies. As any other CMC system, it encompasses file sharing for information exchange through the use of specific software, which handles the capturing, restoring and representation of interaction through video. This is a process, which enables the personalisation of learning (Smyth, 2005) and facilitates peer editing and collaboration (Peterson, 1997; Warschauer, 1997).

Teachers and students when logging in SignLab, work in separate folders, the home directories. In these folders

everyone identifies his/her workplace when entering into SignLab. Everyone's home directory is on the server and whatever is on his/her desktop, is on the server too. In particular, there are three folders on the server: Staff Homes, Staff Private and Teaching Resources. Staff Homes contains the home directories of all teaching staff and can be used by staff and students to send files to each other. Within each person's home is a folder called Public, and within Public is a folder called Drop Box. Anyone can put a file into the Drop Box but only the owner can view the contents of his/her Drop Box.

Staff Private is a shared folder for all staff without access to students and contains the teaching materials that tutors create. Staff can read and write to this folder but students cannot access it at all. Teaching Resources is also a shared folder for all staff and students. However, in this folder staff can both read (open and view) and 'write' (record and edit) while students can only read the files. From the Staff Private folder teachers drop their material to the Teacher Resources folder where students access and work with it while being online.

Panda is used for the delivery of BSL courses. By either filming themselves or by digitising old VHS tapes, teachers and students store these materials into the Teaching Resources folder where they have access and can retrieve them at their convenience. Panda-produced video conversations relate to specific tasks that teachers assign to their students and the completion of a task is the starting point for an on-going SignLab conversation.

In addition, the activities that are used in the SignLab classroom are interactive, in the sense that they actively engage students to the learning process. By using Panda, students are often asked to film themselves signing the content of a video clip they have watched (e.g., transliterate tasks) or do a self-analysis of their own produced video clips. These activities are produced in BSL, thus creating an authentic sign language environment, where students are immersed into the target language.

While being online, tutors' and students' roles are changing. From SignLab experience it is shown that students are more independent and empowered for their own learning. They are recipients and have the control over the learning process. By watching over and over the video material, students correct themselves, imitate Deaf signers' signing and form forms of the target language. In this way, they are able to analyse their signing and realise their strengths and weaknesses (Mertzani, 2005). Each Panda window has basic video control buttons (play, stop, pause and rewind), so that students are able to watch the video by jumping to specific scenes (backwards and forwards), which are interesting or difficult to understand.

The main tutors' role is to answer questions and give feedback concerning unknown vocabulary, syntax and grammar. They usually check students' video signing and post their feedback to students' folders. Panda offers the possibility for an online mark-up assessment, similar to Hada et al. (2005) system introduced above. By using Panda, tutors can open students' original video clip, intervene in its sequence and add their comments and corrections. In this way, they grasp students' mistakes and assess better their BSL skills. On the other hand, students can memorize questions or feedback that occurred during online conversations.

This online communication and collaboration is one-to-one only. These conversations take place between teachers and students rather than between students themselves, but they can be teacher and/or student initiated. Therefore, one teacher or student is able to send his/her video message to another teacher or student only.

Many researchers have argued that CMC provides an excellent vehicle for L2 learning, based on the key premise that CMC affords teachers and learners to negotiate meaning while focusing on the linguistic part of language (Meskill & Antony, 2005). Some of the reasons cited for this assertion are: (a) increased reflection time; (b) more democratic participation; and (c) increased L2 production and discourse quality. From current practices and from preliminary research data (Mertzani, 2005), these reasons appear to apply to SignLab too.

Increased reflection time means that both teachers and students are afforded the needed time to attend to and process the target language, since CMC consists of 'written speech' where language forms are "visually immediate". For learners, it means that they have the opportunity to reflect upon and to look at the form and content of the online message as many times and for as long as they wish (Meskill & Anthony, 2005; Smith, 2003). For teachers, it means that they can detect learners' language, edit their responses and respond to the 'teachable' moments that rendered by the online conversation – see above the online mark-up assessment by using Panda - moments that in classroom time may not have been perceivable (Meskill & Anthony, 2005: 92). For this reason it is claimed that asynchronous is more beneficial than the synchronous CMC (Lamy & Goodfellow, 1999).

In this vein, research in spoken languages has indicated that extra time conversing online in the target language improves students' communicative competence, reading and writing skills (Sanchez, 1996). There is no yet similar research for sign languages, however it is possible to claim that more time on tasks may lead to sign language skills improvement. Furthermore, because of the scarcity of opportunities to hearing students to use sign language outside their classes in meaningful communication, SignLab is a useful tool for language access. Additionally, it is a comfortable environment for students, as they can watch their material and join in conversation whenever

they feel ready.

Moreover, CMC is a less stressful environment for L2 learners especially for those who are traditionally silent or apprehensive producing verbal output in class. It is found that they increase their participation in online discussions compared to face-to-face in the L2 classroom (Jepson, 2005; Warscaheur, 1997). This is because CMC "(a) reduces social context clues related to race, gender, handicap, accent, and status … (b) reduces nonverbal cues, such as frowning and hesitating, which can intimidate people, especially those with less power and authority … [and] (c) allows individuals to contribute at their own time and pace"(Warschaeur, 1997: 473). Consequently, CMC enables learners from varying levels of L2 proficiency and ability to willingly experiment with forms of the target language and to assist one another during online activities (Jepson, 2005).

SignLab is proved to be a relaxed environment for students' learning. Although students are having a visual online communication with their tutors, they are less apprehensive, since they work only with their tutors and they are not exposing themselves to their colleagues. Thus, students feel more comfortable and relaxed, they experience less embarrassment by their mistakes and they are willing to produce more output than in their regular classes. Additionally, tutors' comments are addressed to just one student, so that only the student being corrected can watch the message.

Research has reported that learners develop more complex lexically and syntactically language in their online discussions, which covers a wide range of discourse functions similar to characteristics of oral and written language (Smith, 2003; Warschaeur, 1997). As I have already mentioned, online video communication has resulted in the change of people's signing. Such changes are observed during SignLab conversations. For example, students and teachers, before sending any message, orient themselves in front of the camera and adjust their signing in the visual field of it. They reorganize their sign space and modify sign location and orientation within this new space as well as repeat and slow down their signs. Some students produce video clips in order to check themselves signing. If the signing is not satisfactory (e.g., they are making mistakes while signing), they delete the video and try to produce a new one, avoiding making old signing errors.

4. A FRAMEWORK FOR ONLINE SIGN LANGUAGE PEDAGOGY

As any other CMC environment, SignLab changes teaching by focusing teachers' perspectives on a learner-centred design of instruction (Salaberry, 2000). There are important differences between a traditional and a CMC sign language classroom, as they resulted from current SignLab practices:

1. Recording and exchanging signing involves one person at a time (one-to-one communication).
2. The learning is student-centered rather than teacher-centered.
3. Students function in both initiating and responding roles (asking, giving information and negotiating meaning).
4. The learning is self-pacing and it can occur at any time and any place.
5. The teacher is the facilitator of students' learning rather than the content specialist.
6. The teaching is a constructive process rather than an instructive process.
7. Students work individually with different assignments as well as assessed individually.

SignLab experience shows the importance of a learner-oriented approach in order to match students' needs in their daily work (McAvinia & Hughes, 2003; Palloff & Pratt, 2003). Therefore, there needs to be a general agreement over new sign language pedagogy in terms of language learning methodologies that follow constructivist principles that are currently applied in L2 virtual learning environments. The adaptation of such approaches to videoconferencing, such as SignLab, "require[s] thoughtfulness, reflection and planning so it is probably wise to consider the use of a planning framework … for deciding which types of interactions might appropriately be [employed]" (Smyth, 2005:809).

Constructivistic models of learning call for specification and use of authentic and complex activities during the learning process so that students can perform the tasks by critically reflecting on them (Henze & Nejdl, 1998: 64). CMC should be used not so much to teach curriculum objectives in a different way, but rather to help students understand how their knowledge can be constructed by online collaboration practices (Kern et al., 2004). Consequently, there is the need for sign language tutors to agree upon an overall teaching and learning strategy, which can be adopted by all staff "and not left to the efforts of one or two academics and therefore seen as peripheral" (Gillepsie & McKee, 1999: 452).

The challenge for teachers is to integrate asynchronous CMC into sign language teaching. To present, there is no syllabus specially developed for SignLab and as a result, they follow the one they use at their regular BSL classes. Thus, online sessions and the material used in the SignLab should be carefully sequenced within a curriculum that follows the principles of constructivist methodologies.

This means the implementation of compulsory structure activities that promote online interaction (student-tutor, student-student). Research on L2 learning through CMC shows that jigsaw and decision-making tasks affect students' language acquisition, especially when structure activities are managed by the tutor; these are more likely to result to L2 learning (Smith, 2003; Paran et al., 2004).

Such tasks must be considered integrating into SignLab, although more research is needed to investigate their influences on sign language learning. In addition, the pedagogical design of these tasks must be based on the defining features of CMC environments (Salaberry, 2000; Skehan, 2003), in our case, SignLab environment.

The framework does not imply that tutors should reduce their contribution to managing online activities. On the contrary, tutors are able to work with students individually and develop a personal relationship with them, thereby understanding their needs and control their learning process. This corresponds to conclusions by other researchers (Stepp-Greany, 2002) that tutors play a significant role in a CMC technology instruction. Furthermore, changes in students' role need to be considered by tutors for reflecting on their teaching practices in order to facilitate students' sign language learning (Lam & Lawrence, 2002).

Additionally, the development of CMC environment should be based on the following seven hypotheses (Carol, 1998: 23-25):

1. The linguistic characteristics of L2 input need to be made salient.
2. Learners should receive help in comprehending semantic and syntactic aspects of linguistic input.
3. Learners need to have opportunities to produce L2 output.
4. Learners need to notice errors in their own output.
5. Learners need to correct their linguistic output.
6. Learners need to engage in L2 interaction for the negotiation of meaning.
7. Learners should engage in L2 tasks for maximizing their interaction.

Therefore, online teaching must consider adopting two types of tasks: (a) the "knowledge construction tasks" and (b) the "collaboration tasks". The first category involves tasks that promote learners' construction of sign language skills (receptive, expressive or both). Through these tasks students develop their knowledge by observing and modelling the language. In addition, these tasks comprise the starting point for "collaborative tasks" which constitute on-going discussions about the outcome of a "knowledge construction task". Through these tasks learners develop language by reflecting on the video recorded 'talk'. Students can ask questions, teachers can provide information and feedback (immediate or delayed), teachers and students can come to an agreement upon certain error types and learners can reflect on the feedback and on their own performance. Both tasks can be teacher and/or student initiated.

5. CONCLUSION

SignLab as described in this paper is the first virtual classroom for sign language learning. The last few years we have seen a dramatic expansion of Internet sites concerning online sign language learning and this trend will continue to occur as bandwidth for video transmission is developing. The emergence of such environments is challenging sign language teachers to consider their online roles and teaching strategies. We are still in the early stages and there remains the need for extensive future research. There are still many potential problems associated with the utilisation of SignLab, but more research will shed light into the online educational process.

However, SignLab applications do indeed create the necessity to develop an online pedagogy, including teaching and learning processes that are different from those occurring in traditional sign language environments, of which educators need to be aware. SignLab is a promising online learning tool, yet there is the need to learn more about it in order to unlock its potential for sign language learning.

6. BIBLIOGRAPHICAL REFERENCES

Ashourian, M., Enteshari, R., & Lambadaris, I. (2005). A Low Cost and Efficient Sign Language Video Transmission System. In R. Khosla, R. J. Howlett, & L.C. Jain (Eds.), *Knowledge-Based Intelligent Information and Engineering Systems: 9th International Conference, KES 2005, Melbourne, Australia, September 14-16, 2005, Proceedings, Part II*. Springer Berlin Heidelberg. http://www.springerlink.com/media/2g271r8tqgcwrn42wmf0/contributions/2/e/t/f/2etflbfqujv5rm8u.pdf

Carol, A.C. (1998). Multimedia CALL: Lessons to be Learned from Research on Instructed SLA. *Language Learning and Technology*, 2(1), 22--34.

Cormier, K., & Carss, P. (2004). *SignLab: How to Use Equipment and Software (Staff + Students)*. Bristol: Centre for Deaf Studies, University of Bristol.

Dustdsar,S., & Hofstede, G.J. (1999). Videoconferencing Across Cultures – A Conceptual Framework for Floor Control Issues. *Journal of Information Technology*, 14, 161--169.

Fourie, R.J. (2000). Efficiency of a Hearing Person Learning Sign Language Vocabulary from Media Versus Teacher. *Deafness and Education International*, 2(1), 45--60.

Gillepsie, J., & McKee, J. (1999). Does it Fit and Does it Make Any Difference? Integrating CALL into the Curriculum. *Computer Assisted Language Learning*, 12(5), 441--455.

Gruba, P. (2004). Understanding Digitised Second Language Videotext. *Computer Assisted Language Learning,* 17(1), 51--82.

Hada, Y., Ogata, H., & Yano, Y. (2002). Video-Based Language Learning Environment Using an Online Video-Editing System. *Computer Assisted Language Learning,* 15(4), 387--408.

Henze, N., & Nejdl, W. (1998). A Web-based Learning Environment: Applying Constructivist Teaching

Concepts in Virtual Learning Environments. In F. Verdejo & G. Davies (Eds.), *The Virtual Campus. Trends for Higher Education and Training* (pp. 61-77). London: Chapman and Hall.

Hoemann, H.W. (1978). *Communicating with Deaf People: A Resource Manual for Teachers and Students of American Sign Language.* Baltimore: University Park Press.

Jepson, K. (2005). Conversations -- And Negotiated Interaction -- In Text and Voice Chat Rooms. *Language Learning and Technology*, 9(3), 79--98.

Keating, E., & Mirus, G. (2003). American Sign Language in Virtual Space: Interactions between Deaf Users of Computer-Mediated Video Communication and the Impact of Technology on Language Practices. *Language in Society*, 32: 693--714.

Kern, R., Ware, P., & Warschauer, M. (2004). Crossing Frontiers: New Directions in Online Pedagogy and Research. *Annual Review of Applied Linguistics*, 24, 243--260.

Kinginger, C. (1998). Videoconferencing as Access to Spoken French. *The Modern Language Journal*, 82 (4), 502--513.

Lam, Y. & Lawrence, G. (2002). Teacher-Student Role Redefinition During a Computer-Based Second Language Project: Are Computers Catalysts for Empowering Change? *Computer Assisted Language Learning,* 15, 295--315.

Lamy, M.N. & Goodfellow, R. (1999). "Reflective Conversation" in the Virtual Language Classroom. *Language Learning and Technology*, 2, 43--61.

Martin, M. (2005). Seeing is Believing: The Role of Videoconferencing in Distance Learning, *British Journal of Educational Technology,* 36(3), 397--405.

McAvinia, C., & Hughes, J. (2003). Sharing Systems, Sharing Language: Designing and Working in a Virtual Department. *Computer Assisted Language Learning*, 16(5), 445--467.

Mertzani,M.(2005). Computer-Mediated Communication Technology in Sign Language Teaching and Learning. Its Impact on Students' and Teachers' Roles in the Classroom. Paper presented at the 38th Annual Meeting of BAAL, University of Bristol, September 15 - 17.

Meskill, C., & Anthony, N. (2005). Foreign Language Learning with CMC: Forms of Online Instructional Discourse in a Hybrid Russian Class. *System,* 33, 89--105.

Muir, L.J., & Richardson, I.E. (2005). Perception of Sign Language and Its Application to Visual Communications for Deaf People. *Journal of Deaf Studies and Deaf Education,* 10 (4), 390--401.

Palloff, R.M., & Pratt, K. (2003). *The Virtual Student. A Profile and Guide to Working with Online Learners.* San Francisco: Jossey-Bass.

Paran, A., Furneaux, C., & Summer, N. (2004). Computer-Mediated Communication in Distance MA Programmes: the Students' Perspective. *System,*32, 337--355.

Peterson, M. (1997). Language Teaching and Networking. *System,* 25(1), 29--37.

Ryan, S., Scott, B., Freeman, H., & Patel, D. (2000). *The Virtual University. The Internet and Resource-Based Learning.* London-Sterling (USA): Kogan Page.

Sagawa, H., & Takeuchi, M. (2002). A Teaching System of Japanese Sign Language Using Sign Language Recognition and Generation. In *International Multimedia Conference 2002. Proceedings of the 10th ACM International Conference on Multimedia, December 1-6* (pp 137--145). New York: ACM Press. http://doi.acm.org/10.1145/641007.641035

Salaberry, M.R. (2000). Pedagogical Design of Computer Mediated Communication Tasks: Learning Objectives and Technological Capabilities. *The Modern Language Journal*, 84, 28--37.

Sanchez, B. (1996). MOOving to a New Frontier in Language Teaching. In M. Warschauer (ed.), *Telecollaboration in Foreign Language Learning. Proceedings of the Hawaii Symposium. Honolulu* (pp. 145--163). Hawaii: Second Language Teaching and Curriculum Center, University of Hawaii.

Saxe, D.V., & Foulds, R.A. (2002). Robust Region of Interest Coding for Improved Sign Language Telecommunications. *IEEE Transactions on Information Technology in Biomedicine*, 6(4), 310--316.

Skehan, P. (2003). Focus on Form, Tasks, and Technology. *Computer Assisted Language Learning,* 16 (5), 391--411.

Smith, B. (2003). The Use of Communication Strategies in Computer-Mediated Communication. *System,* 31, 29--53.

Smyth, R. (2005). Broadband Videoconferencing as a Tool for Learner-centred Distance Learning in Higher Education. *British Journal of Educational Technology*, 36 (5), 805--820.

Stepp-Greany, J. (2002). Students Perceptions on Language Learning in a Technological Environment: Implications for the New Millennium. *Language Learning and Technology,* 16, 165--180.

Wang, Y. (2004). Supporting Synchronous Distance Language Learning with Desktop Videoconferencing. *Language Learning and Technology*, 8(3), 90--121.

Warschauer,M. (1997).Computer-Mediated Collaborative Learning: Theory and Practice. *The Modern Journal*, 81, 470--481.